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      (FILE 'USPAT' ENTERED AT 09:08:55 ON 29 SEP 1999)
L1           565 S LASER (P) ENERGY (P) LOW AND (EYE OR CORNEA?)
L2           106 S L1 AND 606/CLAS
L3             5 S L2 AND GALVANOMETER
L4          1182 S GALVANOMETER (P) SCAN? (P) LASER
L5            17 S L4 AND 606/CLAS
L6            26 S LOW (P) (POWER OR ENERGY) (P) LASER (P) CORNE? AND 606/C
LAS
L7             7 S L6 AND MJ
L8           335 S CORNEA (P) LASER AND 606/CLAS
L9            49 S L8 AND (LOW POWER OR LOW ENERGY)
L10           12 S L9 AND MJ
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FOR OFFICIAL USE ONLY

~~2969(?)~~

U.S. DEPARTMENT OF COMMERCE
Patent and Trademark Office

SEARCH REQUEST FORM

247

Examiner # (Mandatory): M. Peffley **Requester's Full Name:** ____________

Art Unit 3739 **Location** (Bldg/Room#): CP2 4E10 **Phone** (circle 305 306 308) 4305

Serial Number: 09/084,441 **Results Format Preferred** (circle): PAPER DISK E-MAIL

Title of Invention Ophthalmic Surgery Method

Inventors (please provide full names): J. T. Lin (name as filed)

Earliest Priority Date: 12/03/92

Keywords (include any known synonyms registry numbers, explanation of initialisms):

A method for eye surgery comprising providing a pulsed laser beam with a repetition rate of at least 20Hz and an energy level of no greater than 10 mJ (milli joule) per pulse, and applying the laser to corneal tissue in a substantially overlapping pattern

Search Topic:

Please write detailed statement of the search topic, and the concept of the invention. Describe as specifically as possible the subject matter to be searched. Define any terms that may have a special meaning. Give examples of relevant citations, authors, etc., if known. You may include a copy of the abstract and the broadcast or most relevant claim(s).

This application is a Reissue of 08/218,319 now U.S. Pat #5,520,679

STAFF USE ONLY

Searcher: Tamie Tobe	Type of Search		Vendors (include cost where applicable)	
Searcher Phone #: 308-6559		N.A. Sequence		STN
Searcher Location: CP4 - 9C18		A.A. Sequence		Questel/Orbit
Date Picked Up: 10/5		Structure (#)		Lexis/Nexis
Date Completed: 10/7	X	Bibliographic	X	WWW/Internet
Clerical Prep Time: 120		Litigation1		In-house sequence systems (list)
Terminal Time: ~~[illegible]~~ 140	X	Fulltext	X	Dialog
Number of Databases: 32		Procurement		Dr. Link
		Other		Westlaw
				Other (specify)

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==============================================================================
*                                                                            *
*   Cover Sheet                                                              *
*                                                                            *
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*** Memo ***

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------------------------------------------------------------------------------
*                                                                            *
*   Prepared for: Mike Peffley                                               *
*                                                                            *
*   By          : Tamie Tobe (308-6559)                                      *
*                                                                            *
*   Date        : October 7, 1999                                            *
*                                                                            *
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Mike,

Here are the search results. Finding the appropriate ranges for both repetition rates and energy levels did not occur. If you have suggestions for other searches please let me know.

Thanks,

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? show files;ds

File 348:European Patents 1978-1999/Oct W39
         (c) 1999 European Patent Office

Set      Items   Description
S1          1    AU="LIN J T"
?
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? t s1/5/1

1/5/1
DIALOG(R)File 348:European Patents

00585345
ORDER fax of complete patent from Dialog SourceOne. See HELP ORDER 348
MULTIWAVELENGTH SOLID STATE LASER USING FREQUENCY CONVERSION TECHNIQUES
Mehrwellenlangen-Festkorperlaser mit Frequenzumwandlung
LASER A SOLIDE A LONGUEURS D'ONDE MULTIPLES UTILISANT DES TECHNIQUES DE CONVERSION DE FREQUENCE
PATENT ASSIGNEE:
LASERSIGHT INCORPORATED, (1614840), 3043 Technology Avenue, Suite 12, Orlando, FL 32817, (US), (applicant designated states: AT;CH;DE;ES;FR;GB;IT;LI;NL;SE)
INVENTOR:
LIN, J. T., 730 Willow Run Lane, Winter Springs, FL 32708, (US)
LEGAL REPRESENTATIVE:
Finck, Dieter, Dr.Ing. et al (3631), Patentanwalte v. Funer, Ebbinghaus, Finck Mariahilfplatz 2 - 3, 81541 Munchen, (DE)
PATENT (CC, No, Kind, Date): EP 597044 A1 940518 (Basic)
EP 597044 A1 940831
EP 597044 B1 980121
WO 9303523 930218
APPLICATION (CC, No, Date): EP 92919772 920724; WO 92US6219 920724
PRIORITY (CC, No, Date): US 736931 910729
DESIGNATED STATES: AT; CH; DE; ES; FR; GB; IT; LI; NL; SE
INTERNATIONAL PATENT CLASS: H01S-003/10; G02F-001/37; G02F-001/39; A61F-009/00; G02B-027/10; H01S-003/23;
NOTE:
No A-document published by EPO
LEGAL STATUS (Type, Pub Date, Kind, Text):

Application:	940518	A1	Published application (A1with Search Report ;A2without Search Report)
Examination:	940518	A1	Date of filing of request for examination: 940111
Search Report:	940831	A1	Drawing up of a supplementary European search report: 940711
Examination:	960124	A1	Date of despatch of first examination report: 951211
Grant:	980121	B1	Granted patent
*Assignee:	980325	B1	Proprietor of the patent (transfer of rights): LaserSight Technologies, Inc. (2447580) 12249 Sciene Drive Suite 160 Orlando, Florida 32826 (US) (applicant designated states: AT;CH;DE;ES;FR;GB;IT;LI;NL;SE)
*Assignee:	980325	B1	Previous applicant in case of transfer of rights (change): LASERSIGHT INCORPORATED (1614840) 3043 Technology Avenue, Suite 12 Orlando, FL 32817 (US) (applicant designated states: AT;CH;DE;ES;FR;GB;IT;LI;NL;SE)
Oppn None:	990113	B1	No opposition filed

LANGUAGE (Publication,Procedural,Application): English; English; English
FULLTEXT AVAILABILITY:

Available Text	Language	Update	Word Count
CLAIMS B	(English)	9804	1168
CLAIMS B	(German)	9804	1218
CLAIMS B	(French)	9804	1411
SPEC B	(English)	9804	3855

Total word count - document A 0
Total word count - document B 7652
Total word count - documents A + B 7652

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? show files;ds

File 344:Chinese Patents ABS Apr 1985-1999/Aug
         (c) 1999 European Patent Office
File 347:JAPIO Oct 1976-1999/Apr.(UPDATED 990812)
         (c) 1999 JPO & JAPIO
File 351:DERWENT WPI 1963-1999/UD=9940;UP=9940;UM=9940
         (c)1999 Derwent Info Ltd
File 371:French Patents 1961-1999/BOPI 9939
         (c) 1999 INPI.  All rts. reserv.

Set     Items   Description
S1         14   AU="LIN J T"
S2          3   S1 AND (LASER? OR EYE? OR OPHTH?)
S3         11   S1 NOT S2
?
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? t s2/5/1-2

2/5/1 (Item 1 from file: 351)
DIALOG(R)File 351:DERWENT WPI

010770705 **Image available**
WPI Acc No: 96-267659/199627
XRPX Acc No: N96-225097
Corneal refractive surgery performing by re-shaping corneal surface - uses UV lasers and IR lasers which are focused into spot size of 0.05-2mm in dia where laser energy per pulse of 0.01-10mJ is sufficient to achieve photo-ablation threshold
Patent Assignee: LASERSIGHT INC (LASE-N)
Inventor: LIN J; LIN J T
Number of Countries: 061 Number of Patents: 003
Patent Family:

Patent No	Kind	Date	Applicat No	Kind	Date	Main IPC	Week
US 5520679	A	19960528	US 92985617	A	19921203	A61N-005/02	199627 B
			US 94218319	A	19940325		
WO 9730752	A1	19970828	WO 96US2663	A	19960226	A61N-005/02	199740 N
AU 9651754	A	19970910	AU 9651754	A	19960226	A61N-005/02	199802 N
			WO 96US2663	A	19960226		

Priority Applications (No Type Date): US 94218319 A 19940325; US 92985617 A 19921203; WO 96US2663 A 19960226; AU 9651754 A 19960226
Cited Patents: US 4718418; US 4729372
Patent Details:

Patent	Kind	Lan	Pg	Filing Notes	Application	Patent
US 5520679	A		16	CIP of	US 92985617	
WO 9730752	A1	E	49			

Designated States (National): AL AU BB BG BR CA CN CZ EE FI GE HU IS JP KP KR LK LR LT LV MG MK MN MX NO NZ PL RO SG SI SK TR TT UA UZ VN
Designated States (Regional): AT BE CH DE DK EA ES FR GB GR IE IT KE LS LU MC MW NL OA PT SD SE SZ UG

Patent	Kind	Lan	Pg	Filing Notes	Application	Patent
AU 9651754	A			Based on		WO 9730752

Abstract (Basic): US 5520679 A

The method involves selecting a laser having a pulsed output beam of set UV wavelength and having an energy level less than 10 mJ/pulse. A scanning mechanism is selected for scanning the selected laser output beam. The scanning mechanism includes a galvanometer type scanning mechanism for controlling the laser beam into an overlapping pattern of adjacent pulses. The laser beam is then coupled to a scanning device for scanning the laser beam over a set surface,

The method also entails focusing the scanning laser beam onto a corneal surface to a set generally fixed spot size. The centre of the scanning laser beam is aligned onto the corneal surface with a visible aiming beam. The scanning mechanism is processed to deliver the scanning laser beam in a set overlapping pattern onto a number of positions on the corneal surface to photo-ablate or photo-coagulate corneal tissue. It removes from 0.05 to 0.5 microns of corneal tissue per pulse overlapped to remove tissue to a desired depth.

USE/ADVANTAGE - In laser ophthalmic surgery. Provides compact, low cost low power laser system with computer controlled contactless process and corneal topography to perform corneal re-shaping.

Dwg.3/11
Title Terms: CORNEA; REFRACT; SURGICAL; PERFORMANCE; SHAPE; CORNEA; SURFACE ; ULTRAVIOLET; LASER; INFRARED; LASER; FOCUS; SPOT; SIZE; DIAMETER; LASER ; ENERGY; PER; PULSE; SUFFICIENT; ACHIEVE; PHOTO; ABLATE; THRESHOLD
Derwent Class: P34; S05; V07; V08
International Patent Class (Main): A61N-005/02
File Segment: EPI; EngPI

2/5/2 (Item 2 from file: 351)
DIALOG(R)File 351:DERWENT WPI

010074461 **Image available**
WPI Acc No: 94-342174/199442
XRAM Acc No: C94-155919
XRPX Acc No: N94-268360

Light amplification method for tunable optical parametric amplifiers and oscillators - using a birefringent nonlinear crystal and a tunable pump laser beam to provide a narrow intense output tunable over UV, IR and visible regions.

Patent Assignee: LIGHT AGE INC (LIGH-N)
Inventor: HELLER D F; JANI M G; LIN J T; POWELL R C; WALLING J C
Number of Countries: 002 Number of Patents: 003
Patent Family:

Patent No	Kind	Date	Applicat No	Kind	Date	Main IPC	Week
WO 9424735	A1	19941027	WO 94US4309	A	19940419	H01S-003/10	199442 B
AU 9467083	A	19941108	AU 9467083	A	19940419	H01S-003/10	199507
US 5606453	A	19970225	US 9349955	A	19930420	H01S-003/10	199714

Priority Applications (No Type Date): US 9349955 A 19930420
Cited Patents: 3.Jnl.Ref; US 4639923; US 5134622; US 5265116
Patent Details:

Patent	Kind	Lan	Pg	Filing Notes	Application	Patent
WO 9424735	A1		40			
AU 9467083	A			Based on		WO 9424735
US 5606453	A		13			

Abstract (Basic): WO 9424735 A

Method comprises orienting a birefringent crystal having nonlinear susceptibility to phase-match light, propagating a pump laser beam tunable within the phase-match range, and producing an idler beam and signal beam. In an optical parametric amplifier, the nonlinear crystal is pref. AgGaSe2, CdSe, KTP, LiIO3, LiNbO3, Ti3AsSe3, urea, beta-BaB2O4, KDP, Ag3AsS3, AgGaS2, GaSe, LiNbP3, chalcopyrite, alpha-HIO3, KBBF, Cs dihydroarsenate, L-arginine phosphate, MgO:LiNbO3, KNbO3, LiB3O5, modulated LiNbO3 or a III-V semiconductor.

Pref. the nonlinear crystal is beta-Ba borate esp. cut to have a phase-match angle of 20-35 deg. at a pump wavelength of 350-500 nm. or a type II KTP crystal with a pump wavelength greater than 400 nm. The pump source is a tunable solid state laser contg. as gain material alexandrite, LiSAF, LiCAF, LSrGaF6 or sapphire:Ti, which may itself be pumped by a semiconductor diode, the material may also be an organic dye soln.

USE - Method allows a narrow, intense, tunable output to be produced.

Dwg.1/6

Title Terms: LIGHT; AMPLIFY; METHOD; TUNE; OPTICAL; PARAMETER; AMPLIFY; OSCILLATOR; BIREFRINGENT; NONLINEAR; CRYSTAL; TUNE; PUMP; LASER; BEAM; NARROW; INTENSE; OUTPUT; TUNE; ULTRAVIOLET; INFRARED; VISIBLE; REGION
Derwent Class: L03; V07; W02
International Patent Class (Main): H01S-003/10
International Patent Class (Additional): H03F-007/00
File Segment: CPI; EPI
?

? t s2/5/3

2/5/3 (Item 3 from file: 351)
DIALOG(R)File 351:DERWENT WPI

009188378 **Image available**
WPI Acc No: 92-315818/199238
XRAM Acc No: C92-140280
XRPX Acc No: N92-241709

Multi-wavelength solid state laser - using basic pulsed solid state laser which is frequency converted by set of novel nonlinear crystals to provide coherent radiation at UV, visible and IR wavelengths

Patent Assignee: LASERSIGHT INC (LASE-N); JTT INT INC (JTTI-N)
Inventor: LIN J T
Number of Countries: 021 Number of Patents: 011
Patent Family:

Patent No	Kind	Date	Applicat No	Kind	Date	Main IPC	Week
US 5144630	A	19920901	US 91736931	A	19910729	H01S-003/10	199238 B
WO 9303523	A1	19930218	WO 92US6219	A	19920724	H01S-003/10	199309
CA 2074749	A	19930130	CA 2074749	A	19920728	H01S-003/18	199315
AU 9225819	A	19930302	AU 9225819	A	19920724	H01S-003/10	199326
EP 597044	A1	19940518	EP 92919772	A	19920724	H01S-003/10	199420
			WO 92US6219	A	19920724		
JP 6509445	W	19941020	WO 92US6219	A	19920724	H01S-003/109	199501
			JP 93503660	A	19920724		
AU 660049	B	19950608	AU 9225819	A	19920724	H01S-003/10	199531
EP 597044	A4	19940831	EP 92919772	A	19920000	H01S-003/10	199533
EP 597044	B1	19980121	EP 92919772	A	19920724	H01S-003/10	199808
			WO 92US6219	A	19920724		
DE 69224197	E	19980226	DE 624197	A	19920724	H01S-003/10	199814
			EP 92919772	A	19920724		
			WO 92US6219	A	19920724		
ES 2111649	T3	19980316	EP 92919772	A	19920724	H01S-003/10	199817

Priority Applications (No Type Date): US 91736931 A 19910729
Cited Patents: US 439907; US 4880996; US 5028816; US 5065046; US 5144630; 9.Jnl.Ref; EP 368512; EP 418890; US 4764930
Patent Details:

Patent	Kind	Lan	Pg	Filing Notes	Application	Patent
US 5144630	A		9			
WO 9303523	A1	E	34			
Designated States (National): AU BR JP KR						
Designated States (Regional): AT BE CH DE DK ES FR GB GR IT LU MC NL SE						
AU 9225819	A			Based on		WO 9303523
EP 597044	A1	E		Based on		WO 9303523
Designated States (Regional): AT CH DE ES FR GB IT LI NL SE						
JP 6509445	W			Based on		WO 9303523
AU 660049	B			Previous Publ.		AU 9225819
				Based on		WO 9303523
EP 597044	B1	E	15	Based on		WO 9303523
Designated States (Regional): AT CH DE ES FR GB IT LI NL SE						
DE 69224197	E			Based on		EP 597044
				Based on		WO 9303523
ES 2111649	T3			Based on		EP 597044

Abstract (Basic): US 5144630 A
A laser apparatus for producing a fifth harmonic generating beam of predetermined wavelength comprises: a solid state laser; a first nonlinear crystal for producing a second harmonic beam focussing optics for focussing the solid state laser beam into the first nonlinear crystal; a second nonlinear crystal positioned adjacent the first crystal for receiving a beam therefrom and producing a fourth harmonic beam; a third nonlinear crystal of beta barium borate (BBO) positioned

adjacent the second nonlinear crystal for receiving a beam therefrom and producing a fifth harmonic beam of predetermined wavelength.

Pref. (i) the solid state laser is an optically pumped Nd-YAG laser with a pulse duration 10 power(-6) - 10 power(-19) secs., and a repetition rate of 1-10 power9 Hz; (ii) the first nonlinear crystal is lithium triborate (LBO) operated at the non-critical phase matching (NCPM) temp. 149 deg. C; (iii) the second non-linear crystal is BBO.

Further disclosed is an integrated laser appts. for producing multiwavelength coherent energy sources, which includes computer controlled optic means for receiving a number of input beams of different frequencies and outputting one of the input beams towards a target. By using optical parametric oscillation in nonlinear crystals the laser system may also produce tunable wavelengths.

USE/ADVANTAGE - Novel multiwavelength solid state laser apparatus in which the generated coherent radiations at U.V., visible and I.R. wavelengths are selected by frequency converters for multiple industrial and surgical applications. Particularly useful for opthalmic surgery.

Dwg.1/5

Title Terms: MULTI; WAVELENGTH; SOLID; STATE; LASER; BASIC; PULSE; SOLID; STATE; LASER; FREQUENCY; CONVERT; SET; NOVEL; NONLINEAR; CRYSTAL; COHERE; RADIATE; ULTRAVIOLET; VISIBLE; INFRARED; WAVELENGTH

Index Terms/Additional Words: OPHTHALMIC; SURGERY

Derwent Class: L03; P32; P81; V07; V08

International Patent Class (Main): H01S-003/10; H01S-003/109; H01S-003/18

International Patent Class (Additional): A61F-009/00; G02B-027/10; G02F-001/35; G02F-001/37; G02F-001/39; H01S-003/23

File Segment: CPI; EPI; EngPI

? t s3/3/all

3/3/1 (Item 1 from file: 351)
DIALOG(R)File 351:DERWENT WPI

011614032
WPI Acc No: 98-031160/199803
XRAM Acc No: C98-010451
XRPX Acc No: N98-025055
Conductive plug manufacture - capable of avoiding generating voids
Patent Assignee: UNITED MICROELECTRONICS CORP (UNMI-N)
Inventor: LIN J; LU H; WU C; LIN J T; LU H B; BU H; WU K
Number of Countries: 007 Number of Patents: 008
Patent Family:

Patent No	Kind	Date	Applicat No	Kind	Date	Main IPC	Week	
TW 314654	A	19970901	TW 96110947	A	19960907	H01L-023/50	199803	B
DE 19710688	A1	19980312	DE 1010688	A	19970314	H01L-021/768	199816	
FR 2753304	A1	19980313	FR 973262	A	19970318	H01L-021/768	199817	
JP 10098013	A	19980414	JP 9760377	A	19970314	H01L-021/285	199825	
GB 2322963	A	19980909	GB 974377	A	19970303	H01L-021/3213	199838	N
NL 1005653	C2	19980929	NL 971005653	A	19970326	H01L-021/441	199901	N
GB 2322963	B	19990224	GB 974377	A	19970303	H01L-021/3213	199910	N
SG 64970	A1	19990525	SG 97695	A	19970308	H01L-023/532	199934	N

Priority Applications (No Type Date): TW 96110947 A 19960907; GB 974377 A 19970303; NL 971005653 A 19970326; SG 97695 A 19970308
Language, Pages: TW 314654 (11); DE 19710688 (6); FR 2753304 (12); JP 10098013 (10)

3/3/2 (Item 2 from file: 351)
DIALOG(R)File 351:DERWENT WPI

010222449
WPI Acc No: 95-123704/199517
Related WPI Acc No: 93-168171; 95-035585; 95-081513; 95-105505
XRAM Acc No: C95-056471
Improving the retention and drainage characteristics of a paper-making process - by adding a water-soluble polyarylamide graft copolymer to the pulp furnish
Patent Assignee: BETZ LAB INC (BETZ); BETZ PAPERCHEM INC (BETZ)
Inventor: CHEN F; HARRINGTON J C; LIAO W P; LIN J T; SCHUSTER M A
Number of Countries: 002 Number of Patents: 003
Patent Family:

Patent No	Kind	Date	Applicat No	Kind	Date	Main IPC	Week	
CA 2127011	A	19950204	CA 2127011	A	19940629	D21H-017/45	199517	B
US 5415740	A	19950516	US 91691206	A	19910425	D21H-017/37	199525	
			US 93773	A	19930105			
			US 94217037	A	19940324			
US 5532308	A	19960702	US 91691206	A	19910425	C08L-051/06	199632	
			US 93773	A	19930105			
			US 94217037	A	19940324			
			US 95373706	A	19950117			

Priority Applications (No Type Date): US 94217037 A 19940324; US 93101139 A 19930803; US 91691206 A 19910425; US 93773 A 19930105; US 95373706 A 19950117
Filing Details:

Patent	Kind	Filing Notes	Application	Patent
US 5415740	A	Div ex	US 91691206	
		CIP of	US 93773	
		Div ex		US 5211854

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            CIP of                            US 5298566
US 5532308  A  Div ex          US 91691206
            CIP of             US 93773
            Div ex             US 94217037
            Div ex                            US 5211854
            CIP of                            US 5298566
            Div ex                            US 5415740
Language, Pages: CA 2127011 (24); US 5415740 (4); US 5532308 (4)
```

3/3/3 (Item 3 from file: 351)

DIALOG(R)File 351:DERWENT WPI


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010134334
WPI Acc No: 95-035585/199505
Related WPI Acc No: 93-168171; 95-081513; 95-105505; 95-123704
XRAM Acc No: C95-015916
```

Novel water-soluble graft copolymers - useful for improving the retention and drainage characteristics of papermaking processes

```
Patent Assignee: BETZ LAB INC (BETZ  )
Inventor: CHEN F; LIAO W P; LIN J T
Number of Countries: 001  Number of Patents: 001
Patent Family:
Patent No   Kind  Date     Applicat No Kind  Date     Main IPC      Week
US 5374336   A  19941220 US 91691206  A  19910425 D21H-021/10   199505 B
                         US 93773     A  19930105
                         US 93101139  A  19930803 B

Priority Applications (No Type Date): US 91691206 A 19910425; US 93773 A
 19930105; US 93101139 A 19930803
Filing Details:
Patent      Kind Filing Notes     Application  Patent
US 5374336   A   Div ex           US 91691206
                 CIP of           US 93773
                 Div ex                        US 5211854
                 CIP of                        US 5298566
Language, Pages: US 5374336 (5)
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3/3/4 (Item 4 from file: 351)

DIALOG(R)File 351:DERWENT WPI


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009932495     **Image available**
WPI Acc No: 94-200206/199424
XRAM Acc No: C94-091507
XRPX Acc No: N94-157472
```

Poled polymeric nonlinear optical material - comprising the poled polymerisation prod. of an imide monomer and a diamino nonlinear optical chromophore

```
Patent Assignee: UNIV NORTHWESTERN (NOUN  )
Inventor: HUBBARD M A; LIN J T; MARKS T J
Number of Countries: 020  Number of Patents: 003
Patent Family:
Patent No   Kind  Date     Applicat No Kind  Date     Main IPC      Week
WO 9412546  A1  19940609 WO 93US11428 A  19931124 C08F-022/40   199424 B
AU 9456772  A   19940622 AU 9456772   A  19931124 C08F-022/40   199436
US 5371173  A   19941206 US 92981342  A  19921125 C08G-073/10   199503

Priority Applications (No Type Date): US 92981342 A 19921125
Filing Details:
Patent      Kind Filing Notes     Application  Patent
WO 9412546  A1
```

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   Designated States (National): AU CA JP
   Designated States (Regional): AT BE CH DE DK ES FR GB GR IE IT LU MC NL
   PT SE
AU 9456772  A  Based on                      WO 9412546
Language, Pages: WO 9412546 (E, 22); US 5371173 (12)
```

3/3/5 (Item 5 from file: 351)

DIALOG(R)File 351:DERWENT WPI


```
009579735
WPI Acc No: 93-273281/199335
XRAM Acc No: C93-121929
```

Paper-making pulp characteristics evaluation appts. - comprises hydrofoil under paper forming surface sepg. two chambers below supply chamber

```
Patent Assignee: BETZ LAB INC (BETZ  ); BETZ PAPERCHEM INC (BETZ  )
Inventor: HOBIRK R A; LIN J T; SCHELLHAMER A J; SCHUSTER M A
Number of Countries: 002  Number of Patents: 002
Patent Family:
Patent No  Kind  Date     Applicat No Kind  Date     Main IPC       Week
CA 2079029  A  19930611 CA 2079029   A  19920924 D21F-001/66   199335 B
US 5314581  A  19940524 US 91805266  A  19911210 D21C-007/00   199420

Priority Applications (No Type Date): US 91805266 A 19911210
Language, Pages: CA 2079029 (55); US 5314581 (7)
```

3/3/6 (Item 6 from file: 351)

DIALOG(R)File 351:DERWENT WPI


```
008954674
WPI Acc No: 92-081943/199211
XRAM Acc No: C92-037853
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Melt-blowing die producing micro-denier fibrous web - having restrictor bar for optimising flow rate for different resins

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Patent Assignee: CHICOPEE (CHIC  )
Inventor: HELMSTETTE G N; HELMYH H; LIN J T; SECHLER W; GUBERNICK D;
  HELMSTETTER G N; KIRCHHOFF R H
Number of Countries: 015  Number of Patents: 005
Patent Family:
Patent No  Kind  Date     Applicat No Kind  Date     Main IPC       Week
EP 474422   A  19920311 EP 91307842  A  19910828                 199211 B
AU 9182756  A  19920305                                          199219
JP 4257306  A  19920911 JP 91239021  A  19910827 D01D-004/02   199243
EP 474422   A3 19920527 EP 91307842  A  19910828                 199331
PT 98796    A  19931130 PT 98796     A  19910828 D04H-001/56   199351

Priority Applications (No Type Date): US 90574429 A 19900829
Filing Details:
Patent    Kind Filing Notes     Application  Patent
EP 474422   A
   Designated States (Regional): AT BE DE DK ES FR GB GR IT LU NL SE
Language, Pages: EP 474422 (10); JP 4257306 (9)
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3/3/7 (Item 7 from file: 351)

DIALOG(R)File 351:DERWENT WPI


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008461694     **Image available**
WPI Acc No: 90-348694/199046
XRPX Acc No: N90-266410
```

Under the hub, stabilised spin electric motor for hard disc drive - with stabiliser supporting stator outer diameter, stiffening motor base, so increasing resonant frequency and vibration tolerance
Patent Assignee: CONNER PERIPHERALS INC (CONN-N)
Inventor: LIN J T
Number of Countries: 012 Number of Patents: 006
Patent Family:

Patent No	Kind	Date	Applicat No	Kind	Date	Main IPC	Week
WO 9013167	A	19901101					199046 B
EP 470074	A	19920212	EP 89912726	A	19891027		199207
JP 4507184	W	19921210	JP 89511803	A	19891027	H02K-005/24	199304
			WO 89US4832	A	19891027		
EP 470074	B1	19940601	EP 89912726	A	19891027	H02K-001/18	199421
			WO 89US4832	A	19891027		
DE 68915787	E	19940707	DE 615787	A	19891027	H02K-001/18	199427
			EP 89912726	A	19891027		
			WO 89US4832	A	19891027		
EP 470074	A4	19920325	EP 89912726	A	19890000		199521

Priority Applications (No Type Date): US 89341040 A 19890420
Filing Details:

Patent	Kind	Filing Notes	Application	Patent
WO 9013167	A			
Designated States (National): JP KR				
Designated States (Regional): AT BE CH DE FR GB IT LU NL SE				
EP 470074	A			
Designated States (Regional): DE FR GB IT NL				
JP 4507184	W	Based on		WO 9013167
EP 470074	B1	Based on		WO 9013167
Designated States (Regional): DE FR GB IT NL				
DE 68915787	E	Based on		EP 470074
		Based on		WO 9013167

Language, Pages: EP 470074 (E, 14)

3/3/8 (Item 8 from file: 351)
DIALOG(R)File 351:DERWENT WPI

008454810 **Image available**
WPI Acc No: 90-341810/199045
XRPX Acc No: N90-261243
Stabilised disc drive spin motor - with base of spin motor stiffened in region surrounding motor to increase resonant frequency
Patent Assignee: CONNER PERIPHERALS INC (CONN-N)
Inventor: LIN J T
Number of Countries: 001 Number of Patents: 001
Patent Family:

Patent No	Kind	Date	Applicat No	Kind	Date	Main IPC	Week
US 4965476	A	19901023	US 89341070	A	19890420		199045 B

Priority Applications (No Type Date): US 89341070 A 19890420

3/3/9 (Item 9 from file: 351)
DIALOG(R)File 351:DERWENT WPI

004724146
WPI Acc No: 86-227488/198635
XRPX Acc No: N86-169797
Radio remote control appts. for automatic rolling doors - has control circuit transferring triggering signal to perform operational control for up, down and stop of door

```
Patent Assignee: LIN J T (LINJ-I)
Inventor: LIN J T
Number of Countries: 003  Number of Patents: 003
Patent Family:
Patent No  Kind  Date     Applicat No Kind  Date     Main IPC      Week
GB 2171545  A  19860828 GB 854546     A  19850221                198635 B
DE 3507123  A  19860904 DE 3507123    A  19850228                198637
CA 1232330  A  19880202                                          198809

Priority Applications (No Type Date): GB 854546 A 19850221; DE 3507123 A
  19850228
Language, Pages: GB 2171545 (16)
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3/3/10 (Item 10 from file: 351)

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DIALOG(R)File 351:DERWENT WPI
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003562946
WPI Acc No: 83-B1138K/198304
XRPX Acc No: N83-014768
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Reinforced precast concrete piling - has frangible sections formed by spiral array of recesses and has mortar infill

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Patent Assignee: LIN J T (LINJ-I)
Inventor: LIN J T
Number of Countries: 011  Number of Patents: 005
Patent Family:
Patent No  Kind  Date     Applicat No Kind  Date     Main IPC      Week
EP 69181    A  19830112 EP 81306196   A  19811231                198304 B
CA 1159268  A  19831227                                          198405
US 4426175  A  19840117 US 81333688   A  19811223                198405
EP 69181    B  19850116                                          198504
DE 3168407  G  19850228                                          198510

Priority Applications (No Type Date): JP 81104795 A 19810703
Filing Details:
Patent      Kind Filing Notes     Application  Patent
EP 69181     A
   Designated States (Regional): AT BE CH DE FR GB IT LI NL
EP 69181     B
   Designated States (Regional): AT BE CH DE FR GB IT LI NL
Language, Pages: EP 69181 (F, 14); EP 69181 (E)
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3/3/11 (Item 11 from file: 351)

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DIALOG(R)File 351:DERWENT WPI
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003452034
WPI Acc No: 82-05799E/198203
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Water vapour permeable reinforced bacterial barrier - comprising foamed latex polymer coated film, flocked fibres and spun-bonded web

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Patent Assignee: JOHNSON & JOHNSON (JOHJ  )
Inventor: LIN J T; MASTROIANN M J
Number of Countries: 001  Number of Patents: 001
Patent Family:
Patent No  Kind  Date     Applicat No Kind  Date     Main IPC      Week
US 4308303  A  19811229                                          198203 B

Priority Applications (No Type Date): US 80177702 A 19800812; US 78956838 A
  19781102
Language, Pages: US 4308303 (5)
?
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? show files;ds

File 344:Chinese Patents ABS Apr 1985-1999/Aug
         (c) 1999 European Patent Office
File 347:JAPIO Oct 1976-1999/Apr.(UPDATED 990812)
         (c) 1999 JPO & JAPIO
File 351:DERWENT WPI 1963-1999/UD=9940;UP=9940;UM=9940
         (c)1999 Derwent Info Ltd
File 371:French Patents 1961-1999/BOPI 9939
         (c) 1999 INPI.  All rts. reserv.

Set     Items   Description
S1     482108   LASER? OR LASER(S)PULSE?
S2       2071   (EYE? OR VISUAL(2N)ORGAN? OR RETINA? OR CORNEA? OR OPTIC? -
             OR OPHTHALM?)(5N)(SURGERY OR PROCEDURE?)
S3     547348   REPET? OR RATE?
S4       1002   20(5W)(HERTZ OR HZ) OR 20 HZ
S5       1613   (MJ OR MILLIJOULE?) OR 10 MJ
S6         22   S1 AND S2 AND S3
S7          4   S4 AND S5
S8          0   S6 AND S7
S9        110   10(5W)(MJ OR MILLJOULE?) OR 10 MJ
S10         1   S6 AND S4-S5
?
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? t s10/5/all

10/5/1 (Item 1 from file: 351)
DIALOG(R)File 351:DERWENT WPI

011702968 **Image available**
WPI Acc No: 98-119878/199811
Related WPI Acc No: 92-166333; 98-239052
XRAM Acc No: C98-039305
XRPX Acc No: N98-095432

Laser surgery apparatus - has argon-fluoride excimer laser directed through mask to form ablation of pre-determined size and depth in corneal tissue

Patent Assignee: VISX INC (VISX-N)
Inventor: TROKEL S
Number of Countries: 001 Number of Patents: 001
Patent Family:

Patent No	Kind	Date	Applicat No	Kind	Date	Main IPC	Week
US 5711762	A	19980127	US 83561804	A	19831215	A61N-005/03	199811 B
			US 86859212	A	19860502		
			US 87109812	A	19871016		
			US 91673541	A	19910318		
			US 92893841	A	19920604		
			US 94341207	A	19941205		
			US 95474243	A	19950607		

Priority Applications (No Type Date): US 83561804 A 19831215; US 86859212 A 19860502; US 87109812 A 19871016; US 91673541 A 19910318; US 92893841 A 19920604; US 94341207 A 19941205; US 95474243 A 19950607

Patent Details:

Patent	Kind	Lan	Pg	Filing Notes	Application	Patent
US 5711762	A		10	Cont of	US 83561804	
				Cont of	US 86859212	
				Cont of	US 87109812	
				Cont of	US 91673541	
				Div ex	US 92893841	
				Div ex	US 94341207	
				Cont of		US 5108388

Abstract (Basic): US 5711762 A

The photoablation laser surgery apparatus (20) comprises: (a) a laser delivery system (22), and a conventional power supply and control system (24) by means of which a laser beam (26) is directed through openings (28), formed in a mask (30), onto the cornea (32) of a human or animal eye (34), where

(b) the laser delivery system (22) includes an argon-fluoride excimer laser generating a laser beam (26) in the far-ultraviolet range of 193 nm (nanometers), and the power supply and control system (24) controls the laser output at pulse energy densities of more than 420 mj cm2 (milijoules cm2) at a repetition rate up to 25 pulses per second, and

(c) the mask (30) has one or more apertures (28) in the form of slits, or circular or crescent shaped openings having a width of between 30 and 800 mu m, which may be formed to provide a graded intensity from edge to centre. The mask (30) is reflective, is made from poly methyl methacrylate, and is provided with metal cooling vanes.

USE - For producing ablative photo-decomposition in ophthalmic surgery.

ADVANTAGE - Interacts exclusively with the irradiated tissues and produces no discernable effect upon the adjacent, unirradiated tissues.

Dwg.3/12

Title Terms: LASER; SURGICAL; APPARATUS; ARGON; FLUORIDE; EXCIMER; LASER;

DIRECT; THROUGH; MASK; FORM; ABLATE; PRE; DETERMINE; SIZE; DEPTH; CORNEA; TISSUE
Derwent Class: A89; P34; S05
International Patent Class (Main): A61N-005/03
File Segment: CPI; EPI; EngPI
?

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? show files;ds

File  98:General Sci Abs/Full-Text 1984-1999/Aug
         (c) 1999 The HW Wilson Co.
File 149:TGG Health&Wellness DB(SM) 1976-1999/Oct W1
         (c) 1999 The Gale Group
File 441:ESPICOM Pharm&Med DEVICE NEWS 1999/Aug W1
         (c) 1999 ESPICOM Bus.Intell.
File 442:AMA  Journals 1982-1999/Jul W4
         (c)1999 Amer Med Assn -FARS/DARS apply
File 444:New England Journal of Med. 1985-1999/Sep W4
         (c) 1999 Mass. Med. Soc.
File 457:The Lancet 1986-1999/Sep W3
         (c) 1999 The Lancet, Ltd.

Set     Items   Description
S1      17792   LASER? OR LASER(S)PULSE?
S2       5587   (EYE? OR VISUAL(2N)ORGAN? OR RETINA? OR CORNEA? OR OPTIC? -
             OR OPHTHALM?)(5N)(SURGERY OR PROCEDURE?)
S3     208490   REPET? OR RATE?
S4        384   20(5W)(HERTZ OR HZ) OR 20 HZ
S5      29767   (MJ OR MILLIJOULE?) OR 10 MJ
S6        751   S1 AND S2 AND S3
S7         84   S4 AND S5
S8          7   S6 AND S7
S9       1536   10(5W)(MJ OR MILLJOULE?) OR 10 MJ
S10         0   S1()S2()S3
S11         4   S8 AND PY<1993
S12         4   RD (unique items)
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? t s12/7/all

12/7/1 (Item 1 from file: 149)
DIALOG(R)File 149:TGG Health&Wellness DB(SM)

01377265 SUPPLIER NUMBER: 14351537 (THIS IS THE FULL TEXT)
The eyes have it. (laser technology in eye surgery) (Lasers)
Kwidzinski, Therese A.
Lasers & Optronics, v11, n12, p21(2)
Nov,
1992

TEXT:

The use of lasers in the surgical treatment of eye disorders began almost three decades ago and has grown to encompass a variety of procedures. A handful of companies have emerged as leaders in the development of laser systems to treat such disorders.

In 1968, Francis L'Esperance began using the argon laser to treat diabetic retinopathy, a pathological deterioration of the retina due to advanced diabetes. In the early 1970s, he conducted human trials using the krypton, frequency doubled Nd:YAG, and [CO.sub.2] lasers. By 1981, there was talk of using dye lasers for photocoagulation to reattach detached retinas, welding the retina back to the eyeball. Because dye lasers can produce the full visible spectrum and emit high powers, they are still used for such procedures today.

Other procedures that can be performed using lasers include posterior capsulotomy, used to clear the posterior lens tissue following conventional cataract surgery; partial excimer trabeculectomy (PET), for the surgical management of glaucoma; laser phacoemulsification, the softening or breaking up of an opacified lens into small pieces so that those pieces may be removed more easily through a very small eye incision. Among the various treatments, transpupillary procedures, are those involving the treatment of intraocular structures by delivering laser energy through the pupil, while transcleral procedures involve the treatment of intraocular structures by delivering laser energy through the sclera, the white part of the eye.

Corneal Shaping

At present, the most talked-about, most-researched area is that of corneal shaping. It offers patients an opportunity to have 20/20 vision without the bother of eyeglasses or contact lenses by correcting such disorders as myopia, or nearsightedness; hyperopia, or farsightedness; and astigmatism -- the three most common refractive disorders.

Though corneal shaping itself is not new, the method is. hi the recent past, radial keratotomy was performed with a diamond knife, which made spoke-like incisions on the cornea. The incisions were believed to weaken the cornea, resulting in unstable vision. When laser beams are used instead of a conventional scalpel, no incisions are made, the cornea heals with a smoother surface, and more stable vision results.

Two such corneal shaping procedures are photorefractive keratectomy (PRK) and laser thermokeratoplasty (LTK). The shape of the cornea, the transparent covering of the eye, determines the eye's ability to focus. A misshapened cornea causes the light to focus in front of or behind the retina, causing blurry vision. Both procedures recontour the shape of the cornea with a laser, allowing visible fight to be properly focused on the retina after treatment. In addition, phototherapeutic keratectomy (PTK), is used to treat superficial scars and other disorders that reduce the transmission of light through the cornea.

PRK is being performed using an argon fluoride excimer laser operating at 193 nm. The ultraviolet light is released in a series of pulses, each lasting only a few nanoseconds. This procedure requires about 15 seconds of actual exposure time to the eye, though the whole procedure -- including prep time -- may take up to a half hour. During PRK treatment for myopia, the laser flattens the corneal curve, ablating submicron layers

of tissue. To treat hyperopia, the curvature of the cornea is steepened by spot coagulation of peripheral corneal tissue using LTK. And in the case of astigmatism, in which the irregular surface of the cornea causes light to focus differently on different spots, LTK can be used to remove tissue from key spots. To treat cloudy or irregular corneas, the PTK treatment removes superficial opacifications, enabling images to clearly focus on the retina. FDA approval is, perhaps optimistically, expected in 1993 for the excimer treatment PTK and in 1994 for PRK.

Eye-Tech Companies

Several U.S. companies are marketing such refractive laser systems. They include VISX Inc., Santa Clara, Calif.; Summit Technology, Waltham, Mass.; LaserSight, Orlando, Fla.; Coherent Medical, Palo Alto, Calif.; Sunrise Technology, Fremont, Calif.; and Lambda Physik, Acton, Mass.

Summit Technology's system, the OmniMed[TM], is unique in that it contains both an argon fluoride excimer laser and a holmium-doped YAG laser. (The OmniMed system has replaced excimer-laser-only ExciMed UV2000. The short ultraviolet pulses of the excimer laser can ablate layers of tissue half the thickness of a human hair from the corneal surface and sculpt it to the desired contour. The excimer laser beam cuts without producing thermal damage, thereby reducing scarring of surrounding tissue.

The Ho:YAG laser produces an infrared beam that is delivered through a quartz fiber. The beam produces heat, which shrinks the collagen (a tissue protein) to change the shape of the cornea. Summit has received FDA approval for the Ho:YAG laser to be used for glaucoma treatment. Trials are underway for its use in the treatment of farsightedness and astigmatism.

At present, OmniMed is being manufactured without the excimer laser, but is designed to accommodate the excimer immediately after it is approved for use by the FDA. OmniMed will allow a physician to perform photorefractive keratectomy (PRK), laser thermokeratoplasty (LTK), partial external trabeculectomy (PET), and phototherapeutic keratectomy (PTK) all from a single unit. Although the appropriate government agencies in the U.S., Japan, and Canada have not yet given their approval of the procedures, the systems are in operation in 34 countries. The cost of the unit is $400,000.

Noteworthy is Summit Technology's patented single-use erodible mask for use in performing PRK with its laser system. Made of plastic, the mask is positioned in a holder above the patient's eye. The laser beam totally vaporizes the mask, leaving a smoothly contoured shape on the cornea. The mask is used in lieu of an adjustable diaphragm, in which the kiser cuts are made in a stepped contour. Since the masks can be custom made to meet specific needs, ophthalmologists may be able to correct more complicated refractive errors such as farsightedness and astigmatism more easily. And because the corneal surface after surgery is smooth rather than rigid, healing is more effective.

Sunrise Technology markets its Model glase 210 for glaucoma treatment. The system uses a pulsed Ho:YAG laser that emits light through a fiberoptic probe at 2.1 [mu]M at a rep rate of 5 Hz. Sunrise received FDA clearance for the glaucoma treatment in 1990 and reports that, since then, between 3,000 and 4,000 patients haw been treated worldwide. The system sells for $55,000.

The Ho:YAG system also has the capability of performing corneal shaping for myopia, hyperopia and astigmatism, eliminating the need for an excimer laser altogether. At this time, Sunrise is conducting Phase 1 clinical trials for corneal shaping and holds a patent for the collagen shrinkage method. The company is planning to take the corneal shaping technology overseas presently.

Lambda-Physik Inc., a subsidiary of Coherent, is also performing laser ablation for glaucoma therapy with its LEX-tra 200 ArF laser. The excimer laser has a wavelength of 193 nm, pulse energy of up to 400 mJ, a pulsewidth of 23 ns, and a rep rate of up to 30 Hz. At present, the procedure is being done in Germany. The price of the LEXtra 200 ArF is $62,000.

VISX serves the PRK and PTK markets with its Twenty/Twentys[R] excimer system. It uses an ArF excimer laser to ablate or remove tissue

without causing heat damage to adjacent tissue. The Twenty/Twenty has 193 run wavelength, 20 ns pulsewidth, a fluence level of 160 mJ/[cm.sup.2], and 0-20 Hz rep rate. Eighty units have been distributed worldwide, with 20 in the U.S. and 60 operational overseas.

FDA clearance is pending for VISX's PTK system, with approval expected in 1993. The company is completing Phase 3 trials for PRK; after fulfilling the one-to two-year followup, FDA approval may be granted anytime from late 1994 to mid-1995. VISX sells the Twenty/ Twenty system for $475,000.

Coherent Medical offers several ophthalmic laser systems. Two argon systems, the Ultima[TM] 2000 and the Novus 2000[R] (which features instantaneous switching between argon and Nd:YAG), are used for treatment of diabetic retinopathy. Photocoagulation by the argon lasers can repair retinal holes, tom or detached retinas, and can stop leakage of serum and blood from blood vessels in the eye.

The 7901 and 7970 Nd:YAG lasers are used specifically for glaucoma treatment. Posterior capsulotomy and iridotomy, which involves relieving fluid pressure from the optic nerve, are two such procedures.

Coherent Medical also manufacturers an argon dye laser, the Lambda Plus[TM]. A choice of 56 different wave-lengths offers the advantage of selecting the precise wavelength for optimal treatment.

LaserSight has developed a solid state ultraviolet laser system to treat myopia using PRK. The LaserHarmonic is a Q-switched Nd:YAG laser that can be frequency-modified to emit at fundamental, second-, and fifth-harmonic wavelengths, as well as emitting in the 1. 8 to 2.4 [mu]m range via an optical parametric oscillator accessory. The company believes its system's multi-wavelength properties give it the versatility replace the use of individual Nd:YAG, Ho:YAG, argon, and excimer lasers for ophthalmologic applications. Though it is still undergoing animal testing in the U.S., LaserSight expects to have LaserHarmonic operating overseas as early as 1993.

Parting Thoughts

Correcting nearsightedness and other common eye disorders using laser systems has become a reality. There is a high success rate -- 85% of the patients who have received PRK treatment have 20/40 vision or better, with 50% of that group reported to have 20/20 vision. Only the remaining 15% are said to have experienced regrowth of some corneal tissue. The cost of the procedure is anticipated to be about $2000 per eye. The side effects reported to date include blurry vision, caused by a haze on the cornea following surgery, and a sensitivity to bright lights. Both are said to be temporary conditions.

With specialty lasers selling for $50-$60,000 and laser systems going for between $450-$600,000, there's a big potential for profit. Can you imagine the day when people will no longer reach for eyeglasses upon waking, or fear falling asleep while wearing contact lenses? Manufacturers can; in fact, they're banking on it.

12/7/2 (Item 1 from file: 442)

DIALOG(R)File 442:AMA Journals

00045704

Corneal Ablation by Nanosecond, Picosecond, and Femtosecond Lasers at 532 and 625 nm (LABORATORY SCIENCES)

STERN, DAVID; SCHOENLEIN, ROBERT W.; PULIAFITO, CARMEN A.; DOBI, ERNEST T.; BIRNGRUBER, REGINALD; FUJIMOTO, JAMES G.
Archives of Ophthalmology
April, 1989; 107: 587-592
LINE COUNT: 00233 WORD COUNT: 03217

ISSN: 0003-9950
CORPORATE SOURCE: Accepted for publication January 13, 1989. From the Laser Research Laboratory, Massachusetts Eye and Ear Infirmary, Harvard Medical School, Boston (Mr Stern and Drs Puliafito and Dobi); and the Department of Electrical Engineering and Computer Science and Research Laboratory of Electronics, Massachusetts Institute of Technology, Cambridge (Mr Schoenlein and Dr Fujimoto). Dr Birngruber is visiting from the H. Wacker Laboratory, Augenklinik der Universitat Munchen, Munich, Federal Republic of Germany. Reprint requests to Laser Research Laboratory, Massachusetts Eye and Ear Infirmary, 243 Charles St, Boston, MA 02114 (Dr Puliafito). This study was supported in part by National Institutes of Health (Bethesda, Md) contract NIH-5-R01-GM35459-04. We gratefully acknowledge Thomas F. Deutsch, PhD, for providing access to the 30-ps laser, and Beat Zysset, PhD, and Gary Gofstein, MS, for technical assistance with the 30-ps experiments. The authors have no proprietary interest in any of the equipment described in this study.

ABSTRACT: We produced corneal excisions with nanosecond (ns)-, picosecond-, and femtosecond (fs)-pulsed lasers at visible wavelengths. The threshold energy for ablation was proportional to the square root of the pulse duration and varied from 2.5 microjoules (mu J) at 100 fs to 500 mu J at 8 ns. Excisions made with picosecond and femtosecond lasers were ultrastructurally superior to those made with nanosecond lasers and, at pulse energies near threshold, showed almost as little tissue damage as excisions made with excimer lasers at 193 nm. We conclude that ultrashort-pulsed lasers at visible and nearinfrared wavelengths are a possible alternative to excimer lasers for corneal surgery and might have advantages over conventional ophthalmic neodymium-YAG lasers for some intraocular applications.

* * USE FORMAT 9 FOR FULL TEXT OF ARTICLE * *

CITED REFERENCES:

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12/7/3 (Item 2 from file: 442)

DIALOG(R)File 442:AMA Journals

00042127

Excimer Laser Keratectomy for Myopia With a Rotating-Slit Delivery System (LABORATORY SCIENCES)

HANNA, KHALIL D.; CHASTANG, J. C.; POULIQUEN, YVES; RENARD, GILLES; ASFAR, LOUIS; WARING, GEORGE O., III
Archives of Ophthalmology
February, 1988; 106: 245-250
LINE COUNT: 00215 WORD COUNT: 02975
ISSN: 0003-9950
CORPORATE SOURCE: Accepted for publication Oct 6, 1987. From the IBM Scientific Center (Dr Hanna and Messrs Chastang and Asfar) and the Department of Ophthalmology (Dr Hanna), INSERM 86 Unit (Drs Pouliquen and Renard), Hotel-Dieu Hospital, Paris; and the Department of Ophthalmology, Emory Eye Center, Atlanta (Dr Waring). Reprint requests to IBM Scientific Center, 36 av R Poincare, 75116 Paris, France (Dr Hanna).

ABSTRACT: We performed argon fluoride excimer laser (193-nm) superficial keratectomy for myopia on human donor eyes and on a resected corneal disc. The laser beam was shaped by a rotating slit to produce a circular ablation 7.5 mm in diameter, with a mathematically defined profile to correct myopia. The fluence at the surface of the cornea was 200 mJ/cm<2>; the laser was fired at 20 Hz. Each 4.5-mJ laser pulse etched a 0.17-mu m deep image of the slit in the cornea. Since the slit moved (0.03 Hz), each successive pulse etched an area adjacent to the previous one, reducing damage from repetitive pulses striking the same area. The slit scanned the cornea many times and the summation of these individual ablations produced the smooth myopic ablation profile, as shown by computerized keratographs and light and electron microscopy.

* * USE FORMAT 9 FOR FULL TEXT OF ARTICLE * *

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12/7/4 (Item 3 from file: 442)

00034114

Excimer Laser Ablation of the Lens (LABORATORY SCIENCES)

NANEVICZ, TANIA M.; PRINCE, MARTIN R.; GAWANDE, ATUL A.; PULIAFITO, CARMEN A.

Archives of Ophthalmology
December, 1986; 104: 1825-1829
LINE COUNT: 00227 WORD COUNT: 03134
ISSN: 0003-9950

CORPORATE SOURCE: Accepted for publication April 30, 1986. From the Laser Research Laboratory, Massachusetts Eye and Ear Infirmary, Department of Ophthalmology, Harvard Medical School (Ms Nanevicz, Mr Gawande, and Dr Puliafito), and the Wellman Laboratories, Massachusetts General Hospital (Drs Prince and Puliafito), Boston. Reprint requests to the Laser Research Laboratory, Massachusetts Eye and Ear Infirmary, 243 Charles St, Boston, MA 02114 (Dr Puliafito). This work was supported in part by a grant from the

Donaldson Trust (New York) and grant No. N-0014-86-K-0117 from the Office of Naval Research, Washington, DC, to Carmen A. Puliafito, MD. Catherine Adler provided technical assistance with the scanning electron microscopy. Alan Ball prepared the manuscript.

ABSTRACT: Ablation of the bovine crystalline lens was studied using radiation from an excimer laser at four ultraviolet wave lengths as follows: 193 nm (argon fluoride), 248 nm (krypton fluoride), 308 nm (xenon chloride), and 351 nm (xenon fluoride). The ablation process was quantitated by measuring mass ablated with an electronic balance, and characterized by examining ablation craters with scanning electron microscopy. The highest ablation rate was observed at 248 nm with lower rates at 193 and 308 nm. No ablation was observed at 351 nm. Scanning electron microscopy revealed the smoothest craters at 193 nm while at 248 nm there was vacuolization in the crater walls and greater disruption of surrounding tissue. The craters made at 308 nm did not have as smooth a contour as the 193-nm lesions. The spectral absorbance of the bovine lens was calculated at the wavelengths used for ablation and correlated with ablation rates and thresholds. High peak-power, pulsed ultraviolet laser radiation may have a role in surgical removal of the lens.

* * USE FORMAT 9 FOR FULL TEXT OF ARTICLE * *

CITED REFERENCES:

1. Trokel SL, Srinivasan R, Braren B: Excimer laser surgery of the cornea. Am J Ophthalmol 1983;96:710-715.

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File 348:European Patents 1978-1999/Oct W39
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Set     Items   Description
S1      48485   LASER? OR LASER(S)PULSE?
S2       1825   (EYE? OR VISUAL(2N)ORGAN? OR RETINA? OR CORNEA? OR OPTIC? -
             OR OPHTHALM?)(5N)(SURGERY OR PROCEDURE?)
S3     182155   REPET? OR RATE?
S4       2715   20(5W)(HERTZ OR HZ) OR 20 HZ
S5       3689   (MJ OR MILLIJOULE?) OR 10 MJ
S6        312   S1 AND S2 AND S3
S7         59   S4 AND S5
S8          5   S6 AND S7
S9        332   10(5W)(MJ OR MILLJOULE?) OR 10 MJ
S10         0   S1()S2()S3
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8/3,K/1
DIALOG(R)File 348:European Patents

00767611
ORDER fax of complete patent from Dialog SourceOne. See HELP ORDER 348
Sodium hyaluronate viscous solutions for use as masking fluid in therapeutic photokeratectomy by means of excimer laser
Natriumhyaluronat enthaltende viskose Losungen zur Verwendung als Maskierungsmittel in therapeutischer Photokeratektomie durch Excimer-Laser
Solutions visqueuses de hyaluronate de sodium pour utilisation comme agent de masquage dans photokeratectomie therapeutique par laser a excimer
PATENT ASSIGNEE:
CHEMEDICA S.A., (2065980), 3, Chemin St. Marc, 1896 Vouvry, (CH),
(applicant designated states:
AT;BE;CH;DE;DK;ES;FR;GB;GR;IE;IT;LI;LU;MC;NL;PT;SE)
INVENTOR:
Cantoro, Amalio, Via Rosolino Pilo, 23, I-40100 Bologna, (IT)
LEGAL REPRESENTATIVE:
Gervasi, Gemma, Dr. et al (40513), NOTARBARTOLO & GERVASI Srl, Corso di Porta Vittoria, 9, 20122 Milano, (IT)
PATENT (CC, No, Kind, Date): EP 719559 A1 960703 (Basic)
EP 719559 B1 980930
APPLICATION (CC, No, Date): EP 95119025 951204;
PRIORITY (CC, No, Date): IT 94RM797 941209
DESIGNATED STATES: AT; BE; CH; DE; DK; ES; FR; GB; GR; IE; IT; LI; LU; MC; NL; PT; SE
INTERNATIONAL PATENT CLASS: A61K-031/715;
ABSTRACT WORD COUNT: 168

LANGUAGE (Publication,Procedural,Application): English; English; English
FULLTEXT AVAILABILITY:

Available Text	Language	Update	Word Count
CLAIMS B	(English)	9840	442
CLAIMS B	(German)	9840	449
CLAIMS B	(French)	9840	460
SPEC B	(English)	9840	4526
Total word count - document A			0
Total word count - document B			5877
Total word count - documents A + B			5877

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... hyaluronate viscous solutions for use as masking fluid in therapeutic photokeratectomy by means of excimer laser
Natriumhyaluronat enthaltende viskose Losungen zur Verwendung als Maskierungsmittel in therapeutischer Photokeratektomie durch Excimer-Laser
... visqueuses de hyaluronate de sodium pour utilisation comme agent de masquage dans photokeratectomie therapeutique par laser a excimer

...ABSTRACT weight are proposed for use as masking fluid in therapeutic photokeratectomy by means of excimer laser (PTK), which realizes the ablation of superficial layers of corneal tissue for the elimination of ...

...SPECIFICATION hyaluronate viscous solutions for use as masking fluid in therapeutic photokeratectomy by means of excimer laser . Particularly, the invention concerns the use of solutions containing sodium hyaluronate of defined molecular weight and concentration with the aim to wet and

protect the cornea during the excimer laser operation for the elimination of corneal uneveness or macula, in order to obtain a smoothing effect in the photoablation.

Prior art

As it is known, in the last decade the ophthalmology surgery has developed a new series of techniques based on the use of excimer laser , which enables the ablation of superficial layers of the corneal tissue exposed to radiations. For such purpose, it is usually used a kind of argon-fluorine laser with emission in the far-ultraviolet radiation field, at a wavelength of 193 nm, which...

...those exposed.

Contrary to other kind of lasers used in the clinical field, the excimer laser does not beam energy concentred in a focal point, but it has a ray of...

...by evaporation, of little thicker than molecular layer of cornea at each impulse.

The excimer laser is largely used, to remodel the cornea for refractive purpose, in a technique known as...

...to converge in a focal point before they hit the retinae. The use of excimer laser permits, in this case, the ablation of superficial layers of corneal tissue of growing thickness...

...which results in a reduction of the corneal curvature.

More recently, the use of excimer laser was proposed for the removal, in therapy, of superficial corneal tissue, for the treatment of...

...corneal erosions, post-operative keratitis, corneal dystrophies such as that of Reis-Bueckler, maculae or corneal lesions due to Herpes simplex, surgery induced superficial uneveness, for example after keratoplasty or refractive corneal operation.

Differently from the case...

...the treated corneal surface. To avoid that, the exposition of the interested area to the laser action, causing the removal of an uniform layer of tissue at each impulse, gives as...

...corneal surface, and furthermore must absorb the ultraviolet radiations at 193 nm and show a rate of ablation possibly nearer to that of the cornea, to simulate the behaviour of the corneal tissue relative to the laser action. Since the laser , at each impulse, removes an uniform thickness of tissue from all the exposed area, an...

...homogenously smoothed surface. Such criteria are disclosed, for example, in Gartry D. et al., "Excimer laser treatment of corneal surface pathology: laboratory and clinical study", Br. J. Ophthalmol., 75, 258-269...

...polyvinyl alcohol solutions, whilst according to V. Thompson et al. (Philosophy and Technique for Excimer Laser Phototherapeutic Keratectomy, Suppl. a Refracr. Corneal Surg., 9, S81-S85, 1993) the more suitable fluid...

...by E. W.Kommehl et al., 1991 (A Comparative Study of Masking Fluids for Excimer Laser Phototherapeutic Keratectomy, Arch. Ophthalmol., 109, 860-863, June 1991). The present authors compared three different... solutions tested in the prior art for use as masking fluid in operations with excimer laser are therefore visco-elastic solutions for ocular surgery, as for example the product commercialized with...

...and in Stark W. J. et al., Clinical Follow-up of 193-nm ArF Excimer Laser Photokeratectomy, Ophthalmol., 99, 805-812, 1992.

Moreover, it is remarkable that these unwanted effects of...

...rapidly and uniformly spread on the treated corneal surface, persisting

on said surface during the laser action, and, moreover, being characterized by a speed of photoablation, under the operative conditions used.. for the production of a masking fluid for the therapeutic photokeratectomy by means of excimer laser . Because of the non-Newton characteristics of hyaluronate, such solution has a relatively low dynamic...

...characteristics of viscosity enables the dispersion of the amount of momentum associated to the incident laser impulse and, above all; its photoablation rate , which is much more similar to that of the corneal tissue than the photoablation rate of HealonR) or 1% HPMC.

A further advantage of the present invention is that the...

...Figures 11A, 11B and 11C relate to topographies and show the corneal surface before the laser treatment (11A) and during treatment (11B and 11C), wherein the present solution was used.

- Figure 12 is a flow curve (dynamic viscosity/shear rate) showing the viscosity behaviour of the present invention with and without citrate.

Detailed description of...

...in presence of citrate the present solution shows better non-Newtonian properties versus the shear rate .

Because of the optimal properties above shown, the proposed masking fluids give the further advantage to enable an objective evaluation of the eveness of the corneal surface obtained during the surgery , because they enable the intraoperative detection of corneal topography. In fact, differently from the known...California) and, where possible, an endothelial test (Keeler Konan Specular, Japan).

Operative surgery

An excimer laser is used, at 193 nm Aesculap Meditec Mel 60 with the following parameters: frequency 20 Hz , fluency 250 mJ /cm2), slot scanning of 10x2 mm, scanning amplitude 10 mm, scanning speed 5.3 mm/sec.

The scan of the laser slot used covers almost the whole corneal surface, in a way to obtain everywhere a uniform reduction of the corneal thickness.

Before each treatment, the rate of ablation and the homogeneity of the laser beam are checked on photographic paper Agfa L750RC. In case of lack of homogeneity of the laser beam, it is necessary to renew the gas or to remove the technical drawback to...

...operator during the whole treatment with the help of two led indicators placed on the laser arm, and possibly it can be modified by intraoperative.

Each patient is submitted to topic...

...the dried areas, lacking fluid, and also by checking the chromatic-sonic changes that the laser beam assumes when directly hits the corneal tissue and no more the masking fluid. Taking...

...a formulation of a masking fluid already largely experimented in PTK by means of excimer laser , an existing marketed solution rendered viscous with 2% by weight hydroxypropylmethylcellulose, which is hereafter indicated...

...and a group of 10, who were treated with FVC 001. The methodology of excimer laser photokeratectomy applied to the two groups is that previously described, with the only variable element...

...in detail, in all the patients were evaluated:

- natural and regulated vision acuity before the laser treatment and every month up to 12 months;
- equal-sphere, sphere and cylinder before and after the laser treatment and every month up to 12 months;

- haze before the laser treatment and every month up to 12 months. As it is known, the vision acuity...

...CLAIMS the preparation of a masking fluid for the therapeutic photokeratectomy by means of an excimer laser , said aqueous solution having a dynamic viscosity ranging from 30 to 43 m Pa.sec...

...viscous aqueous formulation used as a masking fluid for therapeutic photokeratectomy by means of excimer laser , characterized by comprising sodium hyaluronate having a molecular weight ranging from 1,200,000 to...
...CLAIMS en poids dans la preparation d'un fluide de masquage pour la photokeratectomie therapeutique par laser a excimeres, cette solution aqueuse ayant une viscosite dynamique comprise dans la gamme de 30...

...suivantes:
8. Formulation aqueuse visqueuse utilisee comme fluide de masquage pour une photokeratectomie therapeutique par laser a excimeres, caracterisee en ce qu'elle comprend du hyaluronate de sodium ayant un poids...

8/3,K/2
DIALOG(R)File 348:European Patents

00488767
ORDER fax of complete patent from Dialog SourceOne. See HELP ORDER 348
Laser thermokeratoplasty apparatus
Lasergerat zu thermischer Hornhautplastik
Appareil a laser pour la thermokeratoplastie
PATENT ASSIGNEE:
SUMMIT TECHNOLOGY, INC., (823382), 21 Hickory Drive, Waltham, Massachusetts 02154, (US), (applicant designated states: AT;BE;CH;DE;DK;ES;FR;GB;GR;IT;LI;LU;NL;SE)
INVENTOR:
Seiler, Theo, P.O. Box 388, W-8665 Zell, (DE)
LEGAL REPRESENTATIVE:
Holdcroft, James Gerald, Dr. et al (31911), Graham Watt & Co., Riverhead, Sevenoaks, Kent TN13 2BN, (GB)
PATENT (CC, No, Kind, Date): EP 484005 A1 920506 (Basic)
EP 484005 B1 960925
APPLICATION (CC, No, Date): EP 91309541 911016;
PRIORITY (CC, No, Date): US 598118 901016
DESIGNATED STATES: AT; BE; CH; DE; DK; ES; FR; GB; GR; IT; LI; LU; NL; SE
INTERNATIONAL PATENT CLASS: A61F-009/00;
ABSTRACT WORD COUNT: 49

LANGUAGE (Publication,Procedural,Application): English; English; English
FULLTEXT AVAILABILITY:

Available Text	Language	Update	Word Count
CLAIMS A	(English)	EPABF1	488
CLAIMS B	(English)	EPAB96	418
CLAIMS B	(German)	EPAB96	423
CLAIMS B	(French)	EPAB96	498
SPEC A	(English)	EPABF1	3348
SPEC B	(English)	EPAB96	3513
Total word count - document A			3836
Total word count - document B			4852
Total word count - documents A + B			8688

ORDER fax of complete patent from Dialog SourceOne. See HELP ORDER 348
Laser thermokeratoplasty apparatus

Lasergerat zu thermischer Hornhautplastik
Appareil a laser pour la thermokeratoplastie

...SPECIFICATION lenticular implant then inserted under the flap, and the flap sutured up again.
Such invasive corneal procedures are typically limited to treatment of severe conditions, and are generally viewed as a procedures...

...beneficially changes the curvature of the cornea. Other techniques include application of RF current or laser energy to effect permanent change in the corneal collagen.
A problem with heating of the...

...tissue of the cornea and thereby changes the corneal curvature.
The radiation source can be laser or a non-coherent infrared radiation source, preferably operating at a wavelength ranging from about 1.8 micrometers to about 2.3 micrometers. The output can be pulsed or continuous wave ("CW"). Examples of laser radiation sources include Holmium:YAG lasers and CoMgF(sub 2) lasers. Such laser sources can be configured to deliver radiation at a fixed wavelength or be tunable over ...

...focuses the radiation into a cone. In any event, the focusing elements preferably focus the laser radiation to a depth of less than about ... a graded optical element.
In one illustrated embodiment of the invention, the apparatus includes a laser infrared radiation source, a handpiece incorporating a focusing means, and a fiber optic cable which connects the laser to the handpiece. The focusing means is mounted on the handpiece and including a lens arrangement, from which a beam of laser radiation may be projected to a depth of about 300 to 450 micrometers into the...

...the eye when the handpiece is brought into proximity with the corneal surface and the laser is activated.
In another aspect of the invention, a method for shrinking collagen tissue in...

...correlated contraction of the cornea, thus achieving a desired corrected index of refraction of the cornea .
Various corrective procedures can be accomplished by selective heating of the cornea and consequent selective shrinkage of the...and 2, applies infrared radiation from a radiation source 49 (e.g., a Ho:YAG laser), guided by fiber 48 and via delivery device 53, to cornea 12. Delivery device 53...

...compensated by the focusing.
In one embodiment of the invention, a commercially available Ho:YAG laser (available, for example, from Schwarz Corporation, Orlando, Florida, USA) tuned to a wavelength of 2...
...eye with the handpiece in contact with the cornea. The energy output was marimally 35 mJ at a pulse repetition rate of 4 Hertz. Pulse duration was 200 microseconds. The output was adjusted from 10 to 35 mJ per pulse by changing the lamp voltage. Thirty pulses were applied to each coagulation site.
In one group of experiments performed on four blind eyes, two different pulse energies were studied: two eyes with 35 mJ per pulse, two eyes with 25 mJ per pulse. Coagulation sites were established using corneal marker rings having various diameters so that...

...on pulse energy. There appears to be a therapeutic threshold at about 8 to 10 mJ per pulse and saturation limit at energies above 15 mJ per pulse. At about 15 mJ per pulse the effect is approximately linearly related with pulse energy.
The hyperopic correction is...

...the epithelium was healed. No recurrent erosions were observed. The two patients treated with 35 mJ per pulse developed discrete flair in the anterior chamber which apparently resolved after about one...

...perhaps about 15 micrometers) from the endothelium. This is mainly due to focusing of the laser beam in conjunction with the strong absorption of infrared light by the corneal tissue, resulting in a penetration depth of about 300-400 micrometers. As stated above, the focused laser beam produces a cone-shaped coagulation. This leads to a more pronounced shrinkage of the...

...The need for caution in the use of the present invention is self-evident. If laser energy is too high, or improperly focused, damage to the endothelial layer is possible. This...

...circumferential Descemet folds appearing immediately after treatment. To prevent the folds, and endothelial damage, the laser energy is diminished to a lower level and/or a shorter focal length lens system...

...hyperopic effect of the treatment zone beyond about one month of recovery.

Generally, when a pulsed radiation source is employed, the laser energy delivered to the eye per pulse can range from about 5-50mJ (preferably 15-35 mJ). As noted above, the radiation source can be either CW or pulsed . If the radiation source is pulsed , the pulse rate and duration should be chosen to deliver an effective amount of heat within the coagulation zone to induce collagen shrinkage. For example, the pulse rate can vary from about 0.1 to about 20 Hertz and the pulse duration can vary from about 700 nsec to 5 microsec. Typically, the total energy to the eye per spot will range from about 250 mJ to 1.2 J.

It will be understood that the above description pertains to only...

...SPECIFICATION lenticular implant then inserted under the flap, and the flap sutured up again.

Such invasive corneal procedures are typically limited to treatment of severe conditions, and are generally viewed as a procedures ...

...beneficially changes the curvature of the cornea. Other techniques include application of RF current or laser energy to effect permanent change in the corneal collagen.

A problem with heating of the...

...to induce volumetric coagulation in the corneal collagen and thereby steepen regions of the central cornea .

An article titled " Optically coupled technique for photorefractive surgery of the cornea " by J. Taboada and R.H. Poirier, 2412 Optic Letters 15 (1990), May, discloses an optically coupled laser probe and method that achieved noninvasive in vivo refractive flattening of the cornea of experimental eyes . This refractive surgery concept is based on the highly localized photodisruption and/or photoablation of tissue within the...

...focal volume ensures highly localized energy deposition.

WO89/06519 discloses an apparatus and method for laser surgery in which laser energy, pulsed or continuous, is focussed to a focus spot of a few microns which is located within tissue, or the like to cause highly localized heating. The pulsed radiation is in the TEM(oo) mode, has a wavelength of approximately 1064 nanometers, the pulses being not in excess of 100 nanoseconds and the pulse rate being approximately 2000 per second. Where the laser beam is continuous or pulsed , it has a wavelength of approximately 1400 to 1800 nanometers, or in photoablative modes, having...

...may be caused to move relative to the axis of a handpiece which delivers the laser energy to the body. Handpieces are provided in which laser energy is focussed to a focus spot of ten to thirty microns.

The present invention...tissue of the cornea and thereby changes the corneal curvature.
The radiation source can be laser or a non-coherent infrared radiation source, preferably operating at a wavelength ranging from about 1.8 micrometers to about 2.3 micrometers. The output can be pulsed or continuous wave ("CW"). Examples of laser radiation sources include Holmium:YAG lasers and CoMgF(sub(2)) lasers. Such laser sources can be configured to deliver radiation at a fixed wavelength or be tunable over...

...focuses the radiation into a cone. In any event, the focusing elements preferably focus the laser radiation to a depth of less than about 450 micrometers in the corneal tissue.
The...

...a graded optical element.
In one illustrated embodiment of the invention, the apparatus includes a laser infrared radiation source, a handpiece incorporating a focusing means, and a fiber optic cable which connects the laser to the handpiece. The focusing means is mounted on the handpiece and including a lens arrangement, from which a beam of laser radiation may be projected to a depth of about 300 to 450 micrometers into the...

...the eye when the handpiece is brought into proximity with the corneal surface and the laser is activated.

Brief Description of the Drawings
These and other features and advantages of the...
...correlated contraction of the cornea, thus achieving a desired corrected index of refraction of the cornea .
Various corrective procedures can be accomplished by selective heating of the cornea and consequent selective shrinkage of the...and 2, applies infrared radiation from a radiation source 49 (e.g., a Ho:YAG laser), guided by fiber 48 and via delivery device 53, to cornea 12. Delivery device 53...

...compensated by the focusing.
In one embodiment of the invention, a commercially available Ho:YAG laser (available, for example, from Schwarz Corporation, Orlando, Florida, USA) tuned to a wavelength of 2...

...eye with the handpiece in contact with the cornea. The energy output was marimally 35 mJ at a pulse repetition rate of 4 Hertz. Pulse duration was 200 microseconds. The output was adjusted from 10 to 35 mJ per pulse by changing the lamp voltage. Thirty pulses were applied to each coagulation site.
In one ...performed on four blind eyes, two different pulse energies were studied: two eyes with 35 mJ per pulse, two eyes with 25 mJ per pulse. Coagulation sites were established using corneal marker rings having various diameters so that...
...on pulse energy. There appears to be a therapeutic threshold at about 8 to 10 mJ per pulse and saturation limit at energies above 15 mJ per pulse. At about 15 mJ per pulse the effect is approximately linearly related with pulse energy.
The hyperopic correction is...

...the epithelium was healed. No recurrent erosions were observed. The two patients treated with 35 mJ per pulse developed discrete flair in the anterior chamber which apparently resolved after about one...

...perhaps about 15 micrometers) from the endothelium. This is mainly due to focusing of the laser beam in conjunction with the strong absorption of infrared light by the corneal tissue, resulting in a penetration depth of about 300-400 micrometers. As stated above, the focused laser beam produces a cone-shaped coagulation. This leads to a more pronounced shrinkage of the...

...The need for caution in the use of the present invention is self-evident. If laser energy is too high, or improperly focused, damage to the endothelial layer is possible. This...

...circumferential Descemet folds appearing immediately after treatment. To prevent the folds, and endothelial damage, the laser energy is diminished to a lower level and/or a shorter focal length lens system...

...hyperopic effect of the treatment zone beyond about one month of recovery.

Generally, when a pulsed radiation source is employed, the laser energy delivered to the eye per pulse can range from about 5-50mJ (preferably 15-35 mJ). As noted above, the radiation source can be either CW or pulsed . If the radiation source is pulsed , the pulse rate and duration should be chosen to deliver an effective amount of heat within the coagulation zone to induce collagen shrinkage. For example, the pulse rate can vary from about 0.1 to about 20 Hertz and the pulse duration can vary from about 700 nsec to 5 microsec. Typically, the total energy to the eye per spot will range from about 250 mJ to 1.2 J.

It will be understood that the above description pertains to only...

...CLAIMS corneal curvature.
2. The apparatus of claim 1 wherein
 (a) the radiation source is a laser ; or
 (b) the radiation source is pulsed laser having a repetition rate ranging from about 0.1 Hz to about 20 Hz ; or
 (c) the radiation source is a laser having an output wavelength in the range of about 1.8 micrometers to about 2.3 micrometers; or
 (d) the radiation source is a laser having an output wavelength of about 2.06 micrometers; or
 (e) the laser is a Holmium:YAG laser ; or
 (f) the laser is a CoMgF(sub 2) laser .
3. The apparatus of claim 1 wherein
 (a) the focusing means focuses to a depth...

...CLAIMS corneal curvature.
2. The apparatus of claim 1 wherein
 (a) the radiation source is a laser (49); or
 (b) the radiation source is pulsed laser having a repetition rate ranging from about 0.1 Hz to about 20 Hz ; or
 (c) the radiation source is a laser having an output wavelength in the range of about 1.8 micrometers to about 2.3 micrometers; or
 (d) the radiation source is a laser having an output wavelength of about 2.06 micrometers; or
 (e) the laser is a Holmium:YAG laser ; or
 (f) the laser is a CoMgF(sub(2)) laser .
3. The apparatus of claim 1 wherein
 (a) the focusing means focuses to a depth...

...CLAIMS Krummung der Kornea verandert.
2. Das Gerat gemas Anspruch 1, wobei
 (a) die Strahlenquelle ein Laser (49) ist, oder
 (b) die Strahlenquelle ein mit einer Wiederholungsrate von etwa 0,1 Hz bis etwa 20 Hz gepulster Laser ist oder
 (c) die Strahlenquelle ein Laser mit einer Ausgangswellenlange in dem Bereich von etwa 1,8 Mikrometer bis etwa 2,3 Mikrometer ist, oder
 (d) die Strahlenquelle ein Laser mit der Ausgangswellenlange von

etwa 2,06 Mikrometer ist, oder
(e) der Laser ein Holmium: YAG- Laser ist, oder
(f) der Laser ein CoMgF(tiefgestellt(2))- Laser ist.
3. Das Gerat gemas Anspruch 1, wobei
(a) die Fokussiereinrichtung auf eine Tiefe von...
...CLAIMS 2. Appareil selon la revendication 1 dans lequel
(a) la source de rayonnement est un laser (49) ; ou
(b) la source de rayonnement est un laser impulsionnel ayant un rythme de repetitions dans la gamme d'environ 0,1 Hz a environ 20 Hz ; ou
(c) la source de rayonnement est un laser ayant une longueur d'onde de sortie dans la gamme d'environ 1,8 (mu)m a environ 2,3 (mu)m ; ou
(d) la source de rayonnement est un laser ayant une longueur d'onde de sortie d'environ 2,6 (mu)m ; ou
(e) le laser est un laser Holmium:YAG ; ou
(f) le laser est un laser CoMgF(en indice(2)).
3. Appareil selon la revendication 1, dans lequel :
(a) les moyens...

8/3,K/3
DIALOG(R)File 348:European Patents

00384623
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DEVICE FOR PERFORMING LASER SURGERY ON BIOLOGICAL TISSUE.
VORRICHTUNG ZUR MEDIZINISCHEN CHIRURGIE VON BIOLOGISCHEM GEWEBE MITTELS EINES LASERSTRAHLS.
DISPOSITIF POUR PRATIQUER DE LA CHIRURGIE AU LASER SUR DES TISSUS BIOLOGIQUES.
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INVENTOR:
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PATENT (CC, No, Kind, Date): EP 387324 A1 900919 (Basic)
EP 387324 B1 951122
WO 9002537 900322
APPLICATION (CC, No, Date): EP 89909391 890818; WO 89EP973 890818
PRIORITY (CC, No, Date): DE 3831141 880913
DESIGNATED STATES: CH; FR; GB; IT; LI; SE
INTERNATIONAL PATENT CLASS: A61F-009/00; A61B-017/36;
NOTE:
No A-document published by EPO
LANGUAGE (Publication,Procedural,Application): German; German; German
FULLTEXT AVAILABILITY:

Available Text	Language	Update	Word Count
CLAIMS B	(English)	EPAB95	343
CLAIMS B	(German)	EPAB95	280
CLAIMS B	(French)	EPAB95	377
SPEC B	(German)	EPAB95	5146

Total word count - document A 0
Total word count - document B 6146
Total word count - documents A + B 6146

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DEVICE FOR PERFORMING LASER SURGERY ON BIOLOGICAL TISSUE.
DISPOSITIF POUR PRATIQUER DE LA CHIRURGIE AU LASER SUR DES TISSUS BIOLOGIQUES.

...SPECIFICATION verschiedentlich vorgeschlagen worden, biologisches Gewebe unter Ausnutzung des bekannten Effektes der Photodekomposition (Photoatzen) mittels kurzer Laserimpulse abzutragen. Entsprechende Veroffentlichungen finden sich in

1. Health Physics Vol. 40, 1981, s. 677-683, Taboda et al: "Response of the corneal Epithelium to KrF Excimer Laser Pulses ";
2. American Journal of Ophthalmology 96, 1983 S. 710-715, Trokel et al: "Excimer surgery of the cornea "
3. Ophthalmology 92, 1985, S. 741-748, Puliafito et al: "Excimerlaser ablation of the cornea and lens...

...Ophthalmology 103, 1985, S. 1741/1742, Krueger und Trokel: "Quantitation of corneal ablation by ultraviolet laser light";
5. Ophthalmology 12, 1985, S. 749-758, Marshall et al: "An ultrastructural study of...

...of Ophthalmology Vol. 103, S. 713/714, Berlin et al: "Excimerlaser Photoablation in Glaukoma Filtering Surgery ;
7. American Journal of Ophthalmology Vol. 99, S. 483,484, Pellin et al: "Endoexcimerlaser Intraocular Ablative Photodecomposition";
8. Arch. Ophthalmology...

...1 (mu)m und 10 (mu)m, nicht nur aufgrund der kurzeren Wellenlange der Excimer- Laser sondern aufgrund des grundsatzlich anderen Wirkungsprozesses der Photodekomposition, der wie in den Veroffentlichungen beschrieben ein...

...Wegen dieser Schwierigkeiten geht die Tendenz dahin, fur chirurgische Eingriffe an unterschiedlichen biologischem Gewebe verschiedene Laser einzusetzen, bzw. mit unterschiedlichen Wellenlangen zu arbeiten. Dies ist mit einem relativ grosen Aufwand verbunden...

...eine Folge geringerer Temperaturerhohung im Gewebe aufgrund des effektiveren Abtragungsprozesses, wenn vor bzw. wahrend der Laserbehandlung eine absorbierende Substanz zugegeben ist.
Die Vorrichtung nach der Erfindung findet besonders vorteilhaft Anwendung zur...Die Vorrichtung nach der Erfindung macht es moglich als Strahlquelle einen bei 193 nm emittierenden Laser einzusetzen um eine Photoablation der Hornhaut zu bewirken ohne die durch die entstehende Sekundarstrahlung verursachte...

...Bereich heraus diffundiert, in dem der chirurgische Eingriff stattfindet, ist es vorteilhaft, einen intermittierend betriebenen Laser zu verwenden und die absorbierende Substanz in der Zeit zwischen

Laserimpulsen immer wieder aufs neue zuzugeben. Dies kann beispielsweise dadurch erfolgen, das die absorbierende Substanz uber...

...ist;
Figur 10 ein Diagramm, das den Temperaturanstieg in der Hornhaut in Abhangigkeit von der Repetitionsrate des verwendeten Lasers ohne, bzw. bei Zugabe verschiedener UV-absorbierender Substanzen zeigt;
Figur 11 ein...

...Figur 14 ein Diagramm, in dem die Abhangigkeit der Schnittiefe durch die Hornhaut von der Repetitionsrate des verwendeten Lasers bei Zugabe verschiedener UV-absorbierender Substanzen dargestellt ist;
Figur 15 ein Diagramm...

...einer mit UV-absorbierenden Substanz vorbehandelten Hornhaut von der Zeit zwischen Tropfenapplikation und Beginn der Laserbehandlung dargestellt ist;

Figur 16 das Transmissionsspektrum der Hornhaut;
Figur 17a das Spektrum der bei Bestrahlung...

...der Prinzipskizze nach Figur 1 dargestellte Vorrichtung zur Chirurgie am Auge mittels Laserstrahlung enthalt als Lasergenerator einen Xenonchlorid-Excimer- Laser (1), der bei einer Wellenlange von 308 nm strahlt und Pulsbreiten zwischen 40 ns und...auf der Laserwellenlange oder Fluoreszenzstrahlung. Das Photometer (7) ist uber einen Steuerausgang c mit dem Lasergenerator (1) verbunden so das dann, wenn die ruckgestreute Strahlung vorbestimmte Grenzwerte uber- oder unterschreitet, der Laser (1) abgeschaltet werden kann.

Das Handstuck (4) ist uber ein System von Saugleitungen (8a) bzw. Spulleitungen (8b) mit einem geregelten Saug/Spulgerat (8) im Lasergrundgerat verbunden. An die Saug/Spuleinheit (8) ist weiterhin eine Dosiereinheit (9) angeschlossen, von der gezielt...

...ist auserdem ebenso wie die Saug/Spuleinheit (8) uber Steuerleitungen a bzw. b mit dem Lasergenerator (1) so verbunden, das der Laser (10) wahrend der Zugabe der absorbierten Substanz abgeschaltet und nach einer vorbestimmten Pausenzeit wieder eingeschaltet wird. In einer weiteren Ausbaustufe ist es moglich, das der Laser , die Saug/Spuleinrichtung (8) sowie die Dosiereinrichtung (9) von einem Rechner bzw. Mikroprozessor gesteuert wird...

...auch der Ausdruck "Sklerostomie" eingeburgert. Synonym hierzu wird dann, wenn fur diesen Eingriff ein Excimer- Laser verwendet wird, auch der Name "Gonioablation" gebraucht.

Das fur diesen Eingriff verwendete Handstuck ist in...

...isolierten Schweine- und Schafsaugen konnte mittels eines uber eine Quarzfaser in die Vorderkammer eingekoppelten Excimer- Laser -Strahls bei 308 nm im Bereich des Trabekelwerks eine Fistel zwischen der Vorderkammer und dem...

...Saug/Spuleinheit (8) angeschlossen ist.

Die vorstehend beschriebene Sklerostomie wurde nicht nur mit einem Excimer- Laser sondern fur vergleichende Untersuchungen auch mit einem Argon- Laser bei 488 nm und 514 nm sowie mit einem Dauerstrich Nd-YAG- Laser bei 1064 nm durchgefuhrt. Die histologische Untersuchung der operierten Augen zeigte, das sich fur den Nd-YAG- Laser (applizierte Leistung 20-40 Watt bei 0,1 Sekunden Pulsdauer) sowie fur den Argon- Laser (angewandte Leistung 0,3-3 Watt bei Pulsdauern zwischen 0,02 und 1 Sekunde) Nekrosebreiten...

...mu)m und 700 (mu)m ergaben. Im Gegensatz dazu zeigen die mit dem Excimer- Laser bei der Wellenlange 308 nm erzeugten Fistelkanale (Pulsenergie zwischen 2 mJ und 10 mJ bei einer Repetitionsrate von 20 Hz) nur eine 40-60 (mu)m breite Nekrosezone.

Die Breite dieser Nekrosezone konnte auf ein hierin Sulfacetamid.

Beispiel 2

Vitreoablation: Vitrektomie mit dem Excimer- Laser uber eine Glasfaser

Fur die Ausfuhrung dieses Eingriffes wurde das in Figur 3a-c dargestellte...

...13) und der Stirnseite der Faser (3) angesaugt und von dem etwa im Saugkanal liegenden Laserfokus geschnitten. Durch den Saugkanal (16) wird das geschnittene Glaskorpergewebe abgesaugt. Die Ansaugoffnung fur den Glaskorper...

...UV-Streustrahlung abschirmen.

In ersten Vorversuchen konnte gezeigt werden, das sich Glaskorpergewebe mit dem Excimer- Laser bei 308 nm und dem in Figur 3 dargestellten Handstuck schneiden last. Hierbei wurden auch...

...Ablationsrate ermittelt. Als Schwelle fur die Glaskorperablation gab sich dabei etwa ein Wert von 5 mJ /mm(sup 2). Die bei einer

Repetitionsrate (Pulsfrequenz des Lasers) von 20 Hz ermittelten Ablationsraten liegen fur eine 600 (mu)m starke Faser, wie sie im Handstuck nach Figur 3 verwendet wurde, im Bereich von 200 mg/min bei einer Pulsenergie von 15 mJ .

Wurde dem Glaskorper vorher eine UV-absorbierende Substanz zugefuhrt, ergab sich eine drastische Erhohung der...

...eine entsprechende Steuerung der Saug/Spuleinheit (8) erreichen.

Beispiel 3

Endokapsulare Phakoablation mit einem Excimer- Laser uber eine Quarzfaser

Das Handstuck (24) fur diesen Eingriff ist in Figur 4 dargestellt. Es Laser bei 308 nm uber Glasfaser

Fur diesen Eingriff, der durch die Prinzipdarstellung nach Figur 7...

...zuruckubertragene Fluoreszenzstrahlung nach Auskopplung uber den Teilerspiegel (2) mist und uber die Steuerleitung c den Lasergenerator (1) abschaltet, wenn ein zu hohes Fluoreszenzsignal eine ungenugende Konzentration des UV-absorbierenden Medikamentes in...

...die Ablationsrate in Mikrometern pro Puls gegen die Energiedichte der Laserstrahlung vor der Faserspitze in mJ pro Quadratmillimeter aufgetragen. Man erkennt, das die Zugabe der eingangs genannten Substanzen A und B...

...die von 100 Laserpulsen bewirkte Schnittiefe in der Hornhaut in Prozent der Hornhautdicke gegen die Repetitionsfrequenz des Lasers in Hz aufgetragen. Aus der Darstellung ist die hohere Effektivitat der Substanz B zu erkennen, die mit 100 Laserpulsen bei einer Repetitionsrate von 40 Hz Schnitte durch die gesamte Hornhautdicke ermoglicht.

Gleichzeitig senken sowohl die Substanz A...

...klar aus dem Diagramm nach Figur 10, in dem der Temperaturanstieg in Grad gegen die Repetitionsrate des Lasers in Hz fur Hornhaute von Schafen unbehandelt bzw. nach Zugabe der Substanz B...des Beispiels 4 erlauterte Hornhautchirurgie last sich auch mit einem, bei 193 nm emittierenden Excimer- Laser , beispielsweise einem Argon-Fluorid- Laser durchfuhren. Da diese Wellenllange zum derzeitigen Zeitpunkt nicht durch eine Lichtleitfaser gefuhrt werden kann, ist...

...Laserquelle ausgehende Strahlung auf die Hornhaut des Auges (6) fokussiert. Bei einer Bewegung des fokussierten Laserflecks uber die Hornhaut kann der Laser mitbewegt werden oder es kann eine Spiegelanordnung vorgesehen sein, die das Laserlicht dem bewegten optischen...

...die Linse sind. Die Schwelle zur Erzeugung von Linsentrubungen bei diesen Wellenlangen liegt bei 600 mJ /cm(sup 2).

Fig. 18 zeigt die Verhaltnisse, wenn der vom Laserstrahl beaufschlagten Hornhaut eine...

...bei der medizinischen Chirurgie von biologischem Gewebe, bei der neben UV-emittierenden Excimer-Lasern auch Laser verwendet werden, die in anderen Wellenlangenbereichen emittieren. ...

...CLAIMS B1

1. Apparatus for performing surgery on biological tissue with
   - an intermittently operated laser (1),
   - means (3) for transmitting the laser radiation to the site of operation which means are arranged in a hand-piece (4...

...to the site of operation which substance being absorbent in the wavelength region of the laser beam, characterized in that the apparatus further comprises
   - a suction and irrigation unit (8) connected...

...hand-piece (4, 14, 24, 44) for removing tissue ablated by the aid of the

laser radiation, and
- an electronic unit which controles the supply of the absorbing substance by the metering unit (9) within the temporal intervals between the laser pulses .
2. Apparatus of claim 1, characterized in that the means for

transmitting the laser radiation comprises a light conducting fibre (3) which is arranged in the hand-piece (4...

...Apparatus of claim 2, characterized in that the light conducting fibre (3) for transmitting the laser radiation and the irrigation channel (46) of the suction and irrigation unit (8) are embedded...

...measuring the radiation coming out of the site of operation and for switching off the laser (1) when the measured values exceed or drop below pregiven limit values.
6. Apparatus of one of the claims 1 to 6, wherein the laser (1) is an excimer laser emitting ultraviolet radiation and wherein the substance supplied to the site of operation is absorbing...
...CLAIMS B1
1. Vorrichtung zur Chirurgie von biologischem Gewebe mit
- einem intermittierend betriebenen Lasergenerator (1),
- Mitteln (3) zum Ubertragen der Laserstrahlung zum Operationsfeld, die von einem Handstuck (4, 14...

...vorgesehen ist zum Messen von Strahlung aus dem Bereich der Operationsstelle und zum Abschalten des Lasergenerators (1), sobald die gemessenen Werte vorbestimmte Grenzwerte uber- bzw. unterschreiten.
6. Vorrichtung nach mindestens einem der Anspruche 1-6, wobei ein im Ultravioletten strahlender Excimer- Laser als Lasergenerator (1) vorgesehen ist und die dem Operationsfeld zugefuhrte Substanz im Ultravioletten absorbiert. ...
...CLAIMS B1
1. Dispositif pour pratiquer la chirurgie sur un tissu biologique, comportant
- un generateur laser (1) active de facon intermittente,
- des moyens (3) pour transmettre le rayonnement laser au champ operatoire qui sont loges dans une piece a main (4,14,24,44...

...d'une substance, qui est absorbante dans la gamme des longueurs d'onde du faisceau laser , au champ operatoire, caracterise en ce que le dispositif contient en outre
- un dispositif d'aspiration et de balayage (8) pour eliminer le tissu retire par le rayonnement laser , et qui est relie a la piece a main (4,14,24,44), et
- une...

...moyen de l'unite de dosage (9), pendant l'intervalle de temps entre les impulsions laser .
2. Dispositif selon la revendication 1, caracterise en ce qu'il est prevu, comme moyens pour transmettre le rayonnement laser , une fibre conductrice de lumiere (3), qui est saisie par la piece a main (4...
...en ce qu'une fibre conductrice de lumiere (3), utilisee pour la transmission du rayonnement laser , et le canal de balayage (46) du dispositif d'aspiration et de balayage (8) sont...

...mesurer le rayonnement sortant de la zone du champ operatoire et a arreter le generateur laser (1) des que les valeurs mesurees depassent, par valeurs superieures ou inferieures, des valeurs limites...

...au moins l'une des revendications 1-6, dans lequel il est prevu, comme generateur laser (1), un laser excimere emettant dans

l'ultraviolet et que la substance envoyee au champ operatoire est absorbee...

8/3,K/4

DIALOG(R)File 348:European Patents

00346461

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Enhandement of ultraviolet laser ablation and etching of organic solids.
Ultraviolette Laserablation und Atzen von organischen Feststoffen.
Ablation par laser ultraviolet et gravure de solides organiques.

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PATENT (CC, No, Kind, Date): EP 365754 A1 900502 (Basic)
EP 365754 B1 941109

APPLICATION (CC, No, Date): EP 89112410 890707;

PRIORITY (CC, No, Date): US 264476 881028

DESIGNATED STATES: DE; FR; GB

INTERNATIONAL PATENT CLASS: A61B-017/36;

ABSTRACT WORD COUNT: 153

LANGUAGE (Publication,Procedural,Application): English; English; English

FULLTEXT AVAILABILITY:

Available Text	Language	Update	Word Count
CLAIMS A	(English)	EPBBF1	771
CLAIMS B	(English)	EPBBF1	596
CLAIMS B	(German)	EPBBF1	587
CLAIMS B	(French)	EPBBF1	691
SPEC A	(English)	EPBBF1	4817
SPEC B	(English)	EPBBF1	4948
Total word count - document A			5588
Total word count - document B			6822
Total word count - documents A + B			12410

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Enhandement of ultraviolet laser ablation and etching of organic solids.
Ultraviolette Laserablation und Atzen von organischen Feststoffen.
Ablation par laser ultraviolet et gravure de solides organiques.

...ABSTRACT A1

A method and apparatus are described which enhance the ablative effect of a UV laser (10). The ablative effect of a pulsed UV laser (10) is enhanced using a second, longer wavelength pulsed laser (20). Each pulse of the first laser (10) is followed by or combined with a pulse from the second laser (20). The etch depth per pulse is controlled by varying the time between pulses from the first (10) and second (20) lasers. The maximum etch depth per pulse occurs at a time separation which is a function of the substrate (50) being etched. The first laser (10) wavelength is selected to be within the absorption spectrum of the unexcited surface molecules of the substrate (50), while the wavelength of the second laser (20) is selected to be within the absorption spectrum of the surface molecules excited by the incident radiation of the first laser (10). ...

...SPECIFICATION A1

ENHANCEMENT OF ULTRAVIOLET LASER ABLATION AND ETCHING OF ORGANIC SOLIDS

The present invention relates in general to the ablation...

...has been known for some time, having been applied shortly after the invention of the laser . In early work, which used infrared or visible lasers, medical researchers treated animal and human retinas and showed that the laser beam could induce a lesion on the retina for therapeutic purposes. Such laser eye surgery using visible or infrared lasers for detached retinas and other disorders is now routine in eye clinics throughout the world. In these medical applications, and in other applications using laser beams, the laser beam is absorbed by the irradiated tissue causing heating, denaturing of protein, and tissue death...

...from 193 nm to 351 nm are used in polymer ablation as well as in surgery on the cornea and angioplasty.

Ultraviolet radiation is defined as including wavelengths between 150 and 400 nm. In...

...as ablative photodecomposition occurs. One suitable source of ultraviolet wavelength radiation is an ArF excimer laser providing a pulsed output at 193 nm. Such lasers are commercially available.

Ablation is the process by which...

...photodecomposition, it is necessary that the radiation be absorbed by the medium even at low laser power. However, many materials do not absorb sufficient energy to ensure ablation at low fluence...

...to a method of etching using a first and second lasers. This combination of ultraviolet laser wavelengths may be used for medical and dental purposes, and more particularly for etching or...

...is completely defined by the incident radiation.

Many prior art systems include a second visible laser to aid in aiming a non-visible cutting laser . U.S. Patent 3,710,798 Bredemeier and U.S. Patent 4,289,378 Remy et al. describe laser cutting systems using lasers at two distinct wavelengths. A first laser in the visible spectrum illuminates the target area and a second, cutting laser ablates away the organic material.

U.S. Patent 4,408,602 to Nakajima describes a laser ablation system using three laser sources, the radiation from each source being a distinct wavelength. A first source emits a beam in the visible spectrum to aim the laser while the second and third beams are independent cutting sources. The first of these two cutting sources is a CO(sub 2) laser with a wavelength in the infrared region. The second of the cutting lasers is a "YAG" laser which has a wavelength in the visible spectrum. Each of these lasers is effective on...

...the tissue he is attempting to cut.

Koren, in his article entitled "CO(sub 2) Laser Assisted UV Ablative Photoetching of Kapton Films," published July 1984 in Applied Physics Letters, describes the use of an infrared laser source to etch a polymer. In this arrangement, a plasma is created by focusing a first portion of the infrared laser radiation on a tungsten rod, creating an extremely high temperature. The continuous spectrum of ultraviolet...

...plasma is focused on the polymer target along with a second portion of the infrared laser radiation, etching the target. This etch technique is not acceptable in many situations since the infrared laser will tend to cause thermal damage to the material being etched. In addition, this technique...

...optical fibers, especially at the fluencies described.

Where a substrate is ablated by a single laser , the depth of ablation is a function of the wavelength of the incident radiation, the incident power (fluence) of the laser , and the number and duration of the pulses . Therefore, the etch depth may be controlled by changing any of these variables. However, in many situations, the wavelength (i.e., type of laser) and incident power are fixed by the limitations of the available equipment. In order to...

...circumstances it would be advantageous to be able to enhance the etch characteristics of the laser , for example, by using a second, longer wavelength laser in time coherence with the etching laser .
When a laser pulse of a suitable wavelength irradiates a portion of certain substrates, it excites the surface molecules...

...change in their absorption characteristics which makes them susceptible to ablation by a longer wavelength laser pulse . In the method of the present invention a first laser at a short wavelength creates a transient change in the absorption char acteristics of a substrate. This first laser is set at a fluence that is sufficient to change the absorption characteristics of surface molecules. A second laser , with a wavelength within the absorption spectrum of the excited surface molecules, is used simultaneously with or at a fixed time after the first laser to ablate the excited molecules.
More particularly, in the present invention, ablative photodecomposition (APD) is...

...the present invention to provide a means of enhancing the ablation characteristics of an ultraviolet laser .
It is a further object of the present invention to enhance the ablation characteristics of an ultraviolet laser using a second, longer wavelength laser in time coherence at a fixed time after the first ultraviolet laser pulse .
The novel features of the invention are set forth with particularity in the appended claims...

...time between pulses using a substrate.
Fig. 3 is a plot of etch depth per pulse or pair of pulses as a function of the delay time between pulses using a mylar substrate and an optical fiber system to carry the laser beam.
Fig. 4 is a plot of the weight lost as a function of the...

...without sacrificing etching efficiency.
Fig. 1 is a graph of etch depth vs. number of pulses for five combinations of laser power using a PMMA substrate. Plot 101 is the etch depth per pulse of a 308 nm XeCl pulsed excimer laser at a fluence of 760 mJ / cm(sup 2) (millijoules per square centimeter). Plot 102 is the etch depth per pulse of a 193 nm ArF pulsed excimer laser at a fluence of 85 mJ /cm(sup 2). Plot 103 is the etch depth per pulse of the time coincident combination of a 193 nm laser at a fluence of 85 mJ /cm(sup 2) and a 308 nm laser at a fluence of 760 mJ /cm(sup 2). Plot 104 is the etch depth per pulse of a 193 nm laser at a fluence of 186 mJ /cm(sup 2). Plot 105 is the etch depth per pulse of the time coincident combination of a 193 nm laser at a fluence of 186 mJ /cm(sup 2) and a 308 nm laser at a fluence of 760 mJ /cm(sup 2).
PMMA does not absorb very much 308 nm radiation. To etch PMMA with laser pulses at this wavelength, a thermal mechanism must be used. This thermal mechanism requires high fluences (greater than 1 J/cm(sup 2)) and high repetition rates (greater than 20 Hz) which cause intense local heating and result in considerable thermal damage to the etched substrate.
In contrast, smooth etching can be obtained using coincident pulses of 193 nm and 308 nm radiation. Plot 101 of Fig. 1 illustrates that, at ...

...illustrates that etching was achieved using 193 nm radiation at fluences of 85 and 186 mJ /cm(sup 2). However, the combination of the two wavelengths resulted in a 30 to 100 percent increase in the etch depth per pulse pair. In addition, the etched area had a smoothness (i.e., no thermal damage) that is typical of laser etching with 193 nm laser pulses alone. Similar results were obtained on animal tissue (in vitro) using the same two wavelengths...

...that these results can be improved upon by inserting a time delay between the two pulses . Further, it would also be expected that it would be advantageous to follow the 193 nm pulse with the 308 nm pulse .

Fig. 2 illustrates an experiment conducted on PMMA to determine the effect of inserting a time delay between the 193 nm ArF laser pulses and 308 nm XeCl laser pulses . The 193 nm `laser was set at a fluence of 70 mJ /cm(sup 2). The 308 nm laser was set at a fluence of 240 mJ /cm(sup 2). As plot 201 illustrates, the 308 nm, longer wavelength laser had no measurable effect on the substrate when used alone, which would be expected because the wavelength of the 308 nm laser is outside the absorption spectrum of PMMA. The 193 nm laser , in contrast, is well within the absorption spectrum of PMMA and etched the PMMA to a depth of approximately 70 (mu)m after 500 pulses (plot 202).

Plot 203 in Fig. 2 clearly illustrates that the combination of the 193 nm laser and the 308 nm laser provided a substantial improvement in etch depth per pulse pair, and that the degree of improvement depended on the temporal relation between pulses at the two wavelengths. In addition, when the 308 nm laser pulse preceded the 193 nm laser pulse , the effect was not as substantial as when the 193 nm pulse preceded the 308 nm pulse . As can be seen from plot 203, this improvement peaked when the 308 nm pulse followed the 193 nm pulse by approximately 20 to 30 nanoseconds. Of course, different laser wavelengths will have different optimum time separations. For example, the peak in plot 203 would...

...to occur at approximately 40 to 50 nanoseconds of separation using a 248 nm KrF pulsed excimer laser in place of the 193 nm laser . Therefore, the combined effect of the two lasers provides a substantial improvement over using either laser alone, and an even further improvement is provided when the lasers are used in a...

...It is expected that this time sequence, i.e., the optimum length of time between pulses , would be dependent on the type of substrate being ablated, the maximum ablation occurring at...

...different substrates. However, it would also be expected that the shorter wavelength, higher photon energy laser pulse should come first in every instance, with the longer wavelength, lower photon energy (not necessarily lower incident energy) laser pulse being applied second.

The timing of the peak illustrated in Fig. 2 is expected to be independent of the laser power. That is, while the height of the peak will be a function of the incident power, the optimum pulse separation time is not expected to be a function of the incident power. Therefore, the etch depth per pulse may be controlled as a function of the time separation between the two laser pulses for a fixed incident power. In addition, by controlling the pulse separation time it is possible to achieve desirable etch depths with lower incident power levels...

...surface molecules of the substrate are excited to a higher electronic state by a UV laser with a wavelength within the absorption spectrum of the substrate material. The excited molecules have an absorption spectrum which includes the longer wavelength laser , and, therefore, will absorb the energy from the second laser where the unexcited substrate does not absorb energy from the second laser . This phenomenon results in ablation of the excited molecules which were not ablated using the single

UV laser .
According to this theory, when a molecule is excited to a higher energy state such...additional energy is added, the triplets will simply reform as surface molecules. However, a second laser with a wavelength within the absorption spectrum of the excited triplets can add sufficient energy...

...necessary to cause ablation of a substantial majority of the molecules where the shorter wavelength laser provides sufficient energy for the bonds to be broken and ablation to occur. However, it will be necessary in some percentage of the cases where the shorter wavelength laser does not provide sufficient energy for ablation. The improvement in etch depth may then be explained by the additional molecules ablated by the second laser .
More specifically, with a PMMA substrate, 193 nm radiation is used first because that wavelength...

...provided that radiation with sufficient photon energy -- in the case of PMMA, a 308 nm laser -- is incident on the substrate at that point. The 308 nm radiation, being within the...

...triplets" into ablation, resulting in substantially improved etch depths. Thus, the wavelength of a first laser is selected to be within the absorption band of the substrate in order to sufficiently excite the substrate molecules. The wavelength of a second laser is selected to be within the absorption spectrum of the excited triplet molecules. Normally a second laser with a longer (that is, less powerful -- having lower photon energy) wavelength is required, which excites into ablation those molecules not removed by the first laser into ablation, and essentially "cleans" the hole.
This is the best explanation known to the...

...in Figs. 2 and 3. A steep drop-off would not be expected because the rate of dissipation of heat in such insulators is much slower than the drop-off illustrated...

...of approximately 23 J/cm(sup 2), and the combined thermal effect of the infrared laser radiation and the photo chemical (ablative) effect of the broad-spectrum plasma generated radiation etches...

...ultraviolet lasers which give the best ablation (in Fig. 1 the 193 nm far-UV laser), tend to damage or destroy optical fiber when used at incident power levels which are sufficient for etching. However, longer wavelength lasers (e.g., the 308 nm laser) may be used at substantially higher power levels without destroying the fiber optics. Thus, by combining two laser wavelengths, it is possible to etch efficiently in situations where it would not have been possible to effectively etch the substrate using either laser independently. That is, while simply increasing the incident energy fluence of the 193 nm laser would result in a deeper etch depth per pulse , it is not always possible or desirable to simply increase the incident power. Increasing the most commercially available lasers. Further, at higher energy fluence levels a 193 nm UV laser approaches the theoretical limits of the optical fiber to carry radiation. Therefore, it is necessary to find an alternative which increases the etch depth per pulse without increasing the energy fluence of the 193 nm laser .
Fig. 3 illustrates results of an application of the present invention to the ablation of...

...mylar-type substrate. In this experiment the lasers were conducted through optical fibers. The first laser utilized was a 308 nm XeCl pulsed excimer laser at an energy fluence of 80 mJ /cm(sup 2), which is within the absorption spectrum of mylar. The second laser was a 351 nm XeF pulsed excimer laser at an energy fluence of 100 mJ /cm(sup 2), which is outside the absorption spectrum of unexcited mylar. The 351

nm laser did not have a measurable effect on the mylar when used alone (see plot 301), however, one pulse of the 308 nm laser did etch the mylar to an average depth of approximately 0.14 (mu)m per pulse (see plot 302). However, when the effects of the 308 nm and the 351 nm...

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Fig. 4 illustrates the weight loss in milligrams as a function of the number of pulses for a PMMA substrate. Plot 401 illustrates the loss as a function of the number of pulse pairs using a 308 nm laser at a fluence of 800 mJ /cm(sup 2). The weight loss indicated in plot 401 of Fig. 4 at 308...

...taken place. Plot 402 illustrates the weight loss as a function of the number of pulse pairs using a 248 nm laser at a fluence of 1.2 J/cm(sup 2). Finally, plot 403 illustrates the weight loss as a function of the number of pulse pairs using a 248 nm laser at a fluence of 1.2 J/cm(sup 2) followed by a 308 nm laser at a fluence of 800 mJ /cm(sup 2) with a 40 ns delay between the 248 nm and 308 nm pulses .

Fig. 5 is a plot of the weight loss in milligrams vs. the time delay between pulses for a PMMA substrate. The lasers are a 193 nm laser at a fluence of 105 mJ /cm(sup 2) and a 308 nm laser at a fluence of 165 mJ /cm(sup 2). Plot 501 illustrates that there was no measurable weight loss after 2000 pulses of the 308 nm laser alone. Plot 502 illustrates that there was only about 0.1 mg loss after 2000 pulses of the 193 nm laser . Plot 503 illustrates that there was a substantial improvement when the 193 nm laser and 308 nm laser were used with a predetermined time delay. Comparing this figure to Fig. 2, it is...

...arrangement for implementing the present invention. In Fig. 6, a first Lambda-Physik 201E ArF pulsed excimer UV laser 10 produces a pulse of 193 nm wavelength when triggered by a first pulse from a Philips PM 5716 pulse generator 30 which is capable of generating a second pulse at a fixed time delay after the first pulse . The second pulse triggers a Lambda-Physik 201E XeCl pulsed excimer laser 20 which provides a 308 nm pulsed beam that is reflected from both a first mirror 80 and a second, dielectric mirror 90. Mirror 90 is arranged to pass radiation from the 193 nm laser with little or no loss. Radiation from the two lasers is focused on a sample...

...may be used to determine the shape and time separation of the first and second pulses . Photodiode 70 absorbs a portion of the radiation from lasers 10 and 20, and its output is displayed on oscilloscope 40 which is triggered by an output from pulse generator 30. A Scientech 38-2UV5 powermeter 60 measures the power through the mask (without...

...through conventional fiber optics without substantial losses. At power levels sufficient to make the UV laser alone efficient, these losses may result in damage to the optical fiber. Using the present invention, very short wavelength ultraviolet laser radiation, which is difficult to produce and deliver at high energy fluence, can be used at lower fluence with an additional, longer wavelength laser to achieve desirable etch characteristics. The cost of using two lasers is not prohibitive because...can be shared by the two lasers. This makes the

present invention especially appealing for laser angioplasty.
The method described in the present invention is intended to be applicable to any...

...SPECIFICATION has been known for some time, having been applied shortly after the invention of the laser . In early work, which used infrared or visible lasers, medical researchers treated animal and human retinas and showed that the laser beam could induce a lesion on the retina for therapeutic purposes. Such laser eye surgery using visible or infrared lasers for detached retinas and other disorders is now routine in eye clinics throughout the world. In these medical applications, and in other applications using laser beams, the laser beam is absorbed by the irradiated tissue causing heating, denaturing of protein, and tissue death...

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Ablation is the process by which...
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...to a method of etching using a first and second lasers. This combination of ultraviolet laser wavelengths may be used for medical and dental purposes, and more particularly for etching or...

...pattern is completely defined by the incident radiation.
EP-B-0 144 764 discloses a laser catheter with a source of electromagnetic radiation in a wavelength range that can be delivered...

...a blood vessel, with little or no thermal damage to the blood vessel itself. The laser catheter can have an additional source of radiation for removal of calcified material of a...

...visible range are used, if needed.
Many other prior art systems include a second visible laser to aid in aiming a non-visible cutting laser . Us Patent 3,710,798 Bredemeier and U.S. Patent 4,289,378 Remy et al. describe laser cutting systems using lasers at two distinct wavelengths. A first laser in the visible spectrum illuminates the target area and a second, cutting laser ablates away the organic material.
U.S. Patent 4,408,602 to Nakajima describes a laser ablation system using three laser sources, the radiation from each source being a distinct wavelength. A first source emits a beam in the visible spectrum to aim the laser while the second and third beams are independent cutting sources. The first of these two cutting sources is a CO(sub 2) laser with a wavelength in the infrared region. The second of the cutting lasers is a "YAG" laser which has a wavelength in the visible spectrum.
Each of these lasers is effective on...

...he is attempting to cut.
The intermediate document WO-A-90/04358 discloses a first laser beam from a laser which emits light in the range of approximately 500 nm to approximately 1400 nm which...

...medium by the photoacoustic effect or optical penetration break up the solid body. A second laser beam with a wavelength between approximately 170 nm and 550 nm is directed onto the absorbent medium, which is partly

ionized.

Koren, in his article entitled "CO(sub 2) Laser Assisted UV Ablative Photoetching of Kapton Films," published July 1984 in Applied Physics Letters, describes the use of an infrared laser source to etch a polymer. In this arrangement, a plasma is created by focusing a first portion of the infrared laser radiation on a tungsten rod, creating an extremely high temperature. The continuous spectrum of ultraviolet...

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Where a substrate is ablated by a single laser , the depth of ablation is a function of the wavelength of the incident radiation, the incident power (fluence) of the laser , and the number and duration of the pulses . Therefore, the etch depth may be controlled by changing any of these variables. However, in many situations, the wavelength (i.e., type of laser) and incident power are fixed by the limitations of the available equipment. In order to...

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When a laser pulse of a suitable wavelength irradiates a portion of certain substrates, it excites the surface molecules...

...change in their absorption characteristics which makes them susceptible to ablation by a longer wavelength laser pulse . In the method of the present invention a first laser at a short wavelength creates a transient change in the absorption characteristics of a substrate. This first laser is set at a fluence that is sufficient to change the absorption characteristics of surface molecules. A second laser , with a wavelength within the absorption spectrum of the excited surface molecules, is used simultaneously with or at a fixed time after the first laser to ablate the excited molecules.

More particularly, in the present invention, ablative photodecomposition (APD) is...

...the present invention to provide a means of enhancing the ablation characteristics of an ultraviolet laser .

It is a further object of the present invention to enhance the ablation characteristics of an ultraviolet laser using a second, longer wavelength laser in time coherence at a fixed time after the first ultraviolet laser pulse .

The novel features of the invention are set forth with particularity in the appended claims...

...Fig. 1 is a plot of etch depth as a function of the number of pulses for a number of wavelengths and power settings using a polymethyl methacrylate (PMMA) substrate.

Fig. 2 is a plot of etch depth after 500 pulses as a function of the delay time between pulses using a substrate.

Fig. 3 is a plot of etch depth per pulse or pair of pulses as a function of the delay time between pulses using a mylar substrate and an optical fiber system to carry the laser beam.

Fig. 4 is a plot of the weight lost as a function of the number of pulses using a PMMA substrate.

Fig. 5 is a plot of the total weight lost after 2000 pulses as a function of the delay time between pulses using a PMMA substrate.

Fig. 6 illustrates an arrangement which may be used to implement...without sacrificing etching efficiency.

Fig. 1 is a graph of etch depth vs. number of pulses for five combinations of laser power using a PMMA substrate. Plot 101 is the etch depth per pulse of a 308 nm XeCl pulsed excimer laser at a fluence of 760 mJ /cm(sup 2) (millijoules per square centimeter). Plot 102 is the etch depth per pulse of a 193 nm ArF pulsed excimer laser at a fluence of 85 mJ /cm(sup 2). Plot 103 is the etch depth per pulse of the time coincident combination of a 193 nm laser at a fluence of 85 mJ /cm(sup 2) and a 308 nm laser at a fluence of 760 mJ /cm(sup 2). Plot 104 is the etch depth per pulse of a 193 nm laser at a fluence of 186 mJ /cm(sup 2). Plot 105 is the etch depth per pulse of the time coincident combination of a 193 nm laser at a fluence of 186 mJ /cm(sup 2) and a 308 nm laser at a fluence of 760 mJ /cm(sup 2).

PMMA does not absorb very much 308 nm radiation. To etch PMMA with laser pulses at this wavelength, a thermal mechanism must be used. This thermal mechanism requires high fluences (greater than 1 J/cm(sup 2)) and high repetition rates (greater than 20 Hz) which cause intense local heating and result in considerable thermal damage to the etched substrate.

In contrast, smooth etching can be obtained using coincident pulses of 193 nm and 308 nm radiation. Plot 101 of Fig. 1 illustrates that, at ...

...illustrates that etching was achieved using 193 nm radiation at fluences of 85 and 186 mJ /cm(sup 2). However, the combination of the two wavelengths resulted in a 30 to 100 percent increase in the etch depth per pulse pair. In addition, the etched area had a smoothness (i.e., no thermal damage) that is typical of laser etching with 193 nm laser pulses alone. Similar results were obtained on animal tissue (in vitro) using the same two wavelengths...

...that these results can be improved upon by inserting a time delay between the two pulses . Further, it would also be expected that it would be advantageous to follow the 193 nm pulse with the 308 nm pulse .

Fig. 2 illustrates an experiment conducted on PMMA to determine the effect of inserting a time delay between the 193 nm ArF laser pulses and 308 nm XeCl laser pulses . The 193 nm laser was set at a fluence of 70 mJ /cm(sup 2). The 308 nm laser was set at a fluence of 240 mJ /cm(sup 2). As plot 201 illustrates, the 308 nm, longer wavelength laser had no measurable effect on the substrate when used alone, which would be expected because the wavelength of the 308 nm laser is outside the absorption spectrum of PMMA. The 193 nm laser , in contrast, is well within the absorption spectrum of PMMA and etched the PMMA to a depth of approximately 70 (mu)m after 500 pulses (plot 202).

Plot 203 in Fig. 2 clearly illustrates that the combination of the 193 nm laser and the 308 nm laser provided a substantial improvement in etch depth per pulse pair, and that the degree of improvement depended on the temporal relation between pulses at the two wavelengths. In addition, when the 308 nm laser pulse preceded the 193 nm laser pulse , the effect was not as substantial as when the 193 nm pulse preceded the 308 nm pulse . As can be seen from plot 203, this improvement peaked when the 308 nm pulse followed the 193 nm pulse by approximately 20 to 30 nanoseconds. Of course, different laser wavelengths will have different optimum time separations. For example, the peak in plot 203 would...

...to occur at approximately 40 to 50 nanoseconds of separation using a 248 nm KrF pulsed excimer laser in place of the 193 nm laser . Therefore, the combined effect of the two lasers provides a substantial improvement over using either laser alone, and an even further improvement is provided when the lasers are used in a...

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...different substrates. However, it would also be expected that the shorter wavelength, higher photon energy laser pulse should come first in every instance, with the longer wavelength, lower photon energy (not necessarily lower incident energy) laser pulse being applied second.

The timing of the peak illustrated in Fig. 2 is expected to be independent of the laser power. That is, while the height of the peak will be a function of the incident power, the optimum pulse separation time is not expected to be a function of the incident power. Therefore, the etch depth per pulse may be controlled as a function of the time separation between the two laser pulses for a fixed incident power. In addition, by controlling the pulse separation time it is possible to achieve desirable etch depths with lower incident power levels...

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...of most commercially available lasers. Further, at higher energy fluence levels a 193 nm UV laser approaches the theoretical limits of the optical fiber to carry radiation. Therefore, it is necessary to find an alternative which increases the etch depth per pulse without increasing the energy fluence of the 193 nm laser .

Fig. 3 illustrates results of an application of the present invention to the ablation of...

...mylar-type substrate. In this experiment the lasers were conducted through optical fibers. The first laser utilized was a 308 nm XeCl pulsed excimer laser at an energy fluence of 80 mJ /cm(sup 2), which is within the absorption spectrum of mylar. The second laser was a 351 nm XeF pulsed excimer laser at an energy fluence of 100 mJ /cm(sup 2), which is outside the absorption spectrum of unexcited mylar. The 351 nm laser did not have a measurable effect on the mylar when used alone (see plot 301), however, one pulse of the 308 nm laser did etch the mylar to an average depth of approximately 0.14 (mu)m per pulse (see plot 302). However, when the effects of the 308 nm and the 351 nm... ..etch depth was substantial. Plot 303 of Fig. 3 illustrates the average etch depth per pulse pair obtained by separating the first and second laser pulses in time. It will be noted that the optimum delay time between pulses in Fig. 3 is substantially less than the optimum delay time in Fig. 2, which...

..3, in the time period of less than 0 (i.e., where the longer wavelength laser pulse was followed by the shorter wavelength laser pulse), the etch characteristics were also improved over either laser alone. One possible explanation for this phenomenon is that the tail end of the long wavelength laser pulse overlapped the rising portion of the short wavelength laser pulse sufficiently to enhance the effect of the short wavelength laser pulse . However, this would not be a preferred arrangement.

Fig. 4 illustrates the weight loss in milligrams as a function of the number of pulses for a PMMA substrate. Plot 401 illustrates the loss as a function of the number of pulse pairs using a 308 nm laser at a fluence of 800 mJ /cm(sup 2). The weight loss indicated in plot 401 of Fig. 4 at 308...

...taken place. Plot 402 illustrates the weight loss as a function of the number of pulse pairs using a 248 nm laser at a fluence of 1.2 J/cm(sup 2). Finally, plot 403 illustrates the weight loss as a function of the number of pulse pairs using a 248 nm laser at a fluence of 1.2 J/cm(sup 2) followed by a 308 nm laser at a fluence of 800 mJ /cm(sup 2) with a 40 ns delay between the 248 nm and 308 nm pulses .

Fig. 5 is a plot of the weight loss in milligrams vs. the time delay between pulses for a PMMA substrate. The lasers are a 193 nm laser at a fluence of 105 mJ /cm(sup 2) and a 308 nm laser at a fluence of 165 mJ /cm(sup 2). Plot 501 illustrates that there was no measurable weight loss after 2000 pulses of the 308 nm laser alone. Plot 502 illustrates that there was only about 0.1 mg loss after 2000 pulses of the 193 nm laser . Plot 503 illustrates that there was a substantial improvement when the 193 nm laser and 308 nm laser were used with a predetermined time delay. Comparing this figure to Fig. 2, it is...

...arrangement for implementing the present invention. In Fig. 6, a first Lambda-Physik 201E ArF pulsed excimer UV laser 10 produces a pulse

of 193 nm wavelength when triggered by a first pulse from a Philips PM 5716 pulse generator 30 which is capable of generating a second pulse at a fixed time delay after the first pulse . The second pulse triggers a Lambda-Physik 201E XeCl pulsed excimer laser 20 which provides a 308 nm pulsed beam that is reflected from both a first mirror 80 and a second, dielectric mirror 90. Mirror 90 is arranged to pass radiation from the 193 nm laser with little or no loss. Radiation from the two lasers is focused on a sample...may be used to determine the shape and time separation of the first and second pulses . Photodiode 70 absorbs a portion of the radiation from lasers 10 and 20, and its output is displayed on oscilloscope 40 which is triggered by an output from pulse generator 30. A Scientech 38-2UV5 powermeter 60 measures the power through the mask (without...

...through conventional fiber optics without substantial losses. At power levels sufficient to make the UV laser alone efficient, these losses may result in damage to the optical fiber. Using the present invention, very short wavelength ultraviolet laser radiation, which is difficult to produce and deliver at high energy fluence, can be used at lower fluence with an additional, longer wavelength laser to achieve desirable etch characteristics. The cost of using two lasers is not prohibitive because...

...can be shared by the two lasers. This makes the present invention especially appealing for laser angioplasty.
The method described in the present invention is intended to be applicable to any...

...CLAIMS or more of the preceding claims 1 to 4 wherein:
said first and second radiation pulses are laser pulses.
6. The method of one or more of the preceding claims 1 to 5 wherein...

...being in the ultraviolet range.
14. The method of claim 13 wherein:
said radiation comprises laser pulses of distinct wavelengths; and
said laser pulses are spacially coincident.
15. The method of claim 14 wherein:
said laser pulses are spaced in time, a pulse of said one wavelength radiation in the ultraviolet range preceeding a pulse of second wavelength radiation by a predetermined period.
16. The method of claim 15 wherein...

...CLAIMS comprising the steps of:
irradiating said portion of said substrate (50) with a first radiation pulse of a first wavelength;
irradiating said portion of said substrate (50) with a second radiation pulse of a second longer wavelength;
at least one of said first or second radiation pulses having sufficient energy fluence to exceed the threshold for ablative photodecomposition of said portion of said substrate (50), wherein said first and second radiation pulses are laser pulses with said laser pulses being spacially coincident, wherein said first wavelength and said second longer wavelength are within the...

...The method of one or more of the preceding claims 1 to 5 wherein:
said laser pulses are spaced in time,
said first radiation pulse irradiates said substrate (50) prior to said second radiation pulse .
7. The method of claim 6 wherein:
said first radiation pulse precedes said second radiation...

...of radiation by said first (10) and second (20) radiation sources, wherein said radiation comprises laser pulses of distinct wavelengths, said laser pulses being spacially coincident,

wherein said first wavelength and said second longer wavelength are within the...

...CLAIMS ablativen Photodissoziation des Teils des Substrats (50) zu uberschreiten, wobei die ersten und zweiten Strahlungsimpulse Laserimpulse sind, die raumlich koinzident sind, wobei die erste Wellenlange und die zweite langere Wellenlange sich...

...6. Das Verfahren nach einem oder mehreren der vorausgegangenen Anspruche 1 bis 5, wobei:
die Laserimpulse in zeitlichem Abstand erfolgen,
der erste Strahlungsimpuls das Substrat (50) vor dem zweiten Strahlungsimpuls bestrahlt...

...Strahlungserzeugung durch die erste (10) und die zweite (20) Strahlungsquelle zu steuern, wobei die Strahlung Laserimpulse verschiedener Wellenlangen umfast und die Laserimpulse raumlich koinzident sind, wobei sich die erste Wellenlange und die zweite langere Wellenlange im ultravioletten...

...CLAIMS 50), dans laquelle lesdites premiere et seconde impulsions de radiation sont des impulsions du type laser , lesdites impulsions laser etant spatialement coincidentes, dans laquelle ladite premiere longueur d'ondes et ladite seconde longueur d...

...l'une ou de plusieurs des revendications precedentes 1 a 5, dans laquelle:
- lesdites impulsions laser sont espacees en temps,
- ladite premiere impulsion de radiation irradie ledit substrat (50) avant ladite...

...de plusieurs des revendications precedentes 1 a 8, dans laquelle:
- lesdites etapes d'irradiation sont repetees un nombre de fois predetermine.
10. La methode de l'une ou de plusieurs des...

...premiere (10) et seconde (20) sources de radiation, dans lequel ladite radiation comprend des impulsions laser de longueurs d'ondes distinctes, lesdites impulsions laser etant spatialement coincidentes, dans lequel ladite premiere longueur d'ondes et ladite seconde longueur d...

8/3,K/5
DIALOG(R)File 348:European Patents

00321943
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Device for correcting the shape of an object by laser treatment.
Vorrichtung zur Formkorrektur eines Gegenstandes durch Laserbehandlung.
Dispositif de correction de la forme d'un objet par un traitement laser.
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PATENT (CC, No, Kind, Date): EP 296982 A1 881228 (Basic)
EP 296982 B1 930915
APPLICATION (CC, No, Date): EP 88401607 880624;
PRIORITY (CC, No, Date): FR 878963 870625
DESIGNATED STATES: DE; FR; GB
INTERNATIONAL PATENT CLASS: A61F-009/00;
ABSTRACT WORD COUNT: 144

LANGUAGE (Publication,Procedural,Application): English; English; English
FULLTEXT AVAILABILITY:

Available Text	Language	Update	Word Count
CLAIMS B	(English)	EPBBF1	3710
CLAIMS B	(German)	EPBBF1	1948
CLAIMS B	(French)	EPBBF1	2149
SPEC B	(English)	EPBBF1	13902
Total word count - document A			0
Total word count - document B			21709
Total word count - documents A + B			21709

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Device for correcting the shape of an object by laser treatment.
Vorrichtung zur Formkorrektur eines Gegenstandes durch Laserbehandlung .
Dispositif de correction de la forme d'un objet par un traitement laser .

...ABSTRACT A1
The invention concerns a device for correcting the shape of an object by laser treatment.
The device comprises means (1) for emitting a laser beam (FL) and means (2) for generating a treatment laser beam (FLT) comprising at least one lobe of elongate cross-section. Means (3) enable focussing of the image of the lobe or lobes of the treatment laser beam on the area of the object (OE) to be corrected and means (4) enable displacement of the image of the lobe of the treatment laser beam in translation or in rotation over the area of the object to be corrected...

...SPECIFICATION B1
The present invention relates to a device for performing surgery on the cornea of the eye . The purpose of such modifications of the shape of the cornea is to correct ametropia by correcting dimensional optical characteristics of the cornea and principally its...

...patient after treatment.
However, recent work has shown the very precise ablative properties of excimer laser radiation when this radiation is applied to the corneal tissue. The radiation emitted by an excimer laser , with a wavelength substantially equal to 193 nm, may be used to eliminate corneal material by photodecomposition. Generally speaking, a round light spot (an image of the laser beam) is formed on the cornea, the spot being substantially centered on the optical axis of the eyeball. The spot has a substantially circular or annular...

...photodecomposition vary with the size of the light spot and the energy density of the laser beam used. Moreover, the surface state of the cornea after treatment and undesirable side effects due to thermal or shockwave phenomena vary significantly with the energy level delivered by each pulse and the repetition frequency with which the same area is successively irratiated.
EP- A -0 207 648 discloses a system for ophtalmological surgery in which a cross section image of a laser beam is focused on to the corneal area to be treated . Successive openings of a masking plate are placed successively across the laser beam, in a fixed position in which each of them, successively, lies symmetrical with the...

...openings are identical, i.e. circular, rectangular or elliptical, but their sizes incremently differ from one another, so that the cross section of the laser beam image on the cornea is varied for a single treatment operation, and the depth of irradiation of the focused beam is determined through the laser pulses number during illimination or by the duration of illumination in case continuous laser is used.

Since the dimensions of the cross section of the laser beam image are varied while the shapes and positions of the successive openings are identical...

...density focused on to the cornea at the level of the focused image of the laser beam has not a constant value.

DE-A-3 535 073 discloses a rotational diaphragm intended for controlling the depth at which a laser beam irradiates cornea, as a function of the thickness of the cornea, which is thicker at its periphery than at its center, taking into account the non- uniform incidence of the laser beam on the corneal surface, due to the curvature thereof.

In fact, DE-A-3-535 073 does not deal with the specific correction of different kinds of ametropy.

An object of the device in accordance with the present invention for performing surgery on the cornea of the eye using laser radiation is to remedy the aforementioned disadvantages through the use of a device enabling an ablation process to be carried out by successive discrete ablations, the total ablation resulting from the summation of numerous discrete ablations, while avoiding irradiating the same area with two or more consecutive pulses and limiting the surface area irradiated by each pulse.

Another object of the present invention is the use of a device in which each elementary discrete...

...effected, having a minimum degree of roughness, the reduction of undesirable side effects such as shockwave and thermal effects making it possible to preserve and respect the integrity of surrounding tissue.

Another object of the present invention is the use of a refractive surgery device for laser treatment of the cornea of the eye anabling direct operation on the eyeball of the...

...assisted.

The present invention proposes a device for shaping the shape of an object by laser ablation of a surface of said object according to an ablation function, said device comprising :

. means for generating a pulsed laser beam having pulses and an energy density,

. slit means having at least one slit intercepting said laser beam, said at least one slit ...elementary discrete ablations of said surface of said object,

. means for synchronizing said increment, said pulses and said energy density, so that the total ablation resulting from the summation of said ...

...figure 1 shows a graph plotting the depth of a discrete elementary ablation by one laser emission pulse as a function of the radiation energy density,

- figure 2a shows a plan view of...

...of parameters defining the surface to be treated,

-. figure 2b shows a view in cross- section on the line A-A in figure 2a with the corresponding definition of parameters defining...

...area removed by photodecomposition,

- figure 3a shows a block diagram of the device in accordance with the invention in the case where the image of the treatment laser beam is moved in rotation,

- figure 3b shows a particularly advantageous object slit enabling treatment...

...keratomileusis of hypermetropia in the case of the embodiment of the device from figure 3a,

- figure 3d shows in a non-limiting way one embodiment of an object slit with multiple lobes enabling treatment of myopia by keratomileusis in the same way as in the case of figure 3b,
- figures 3e and...

...respectively represent in an advantageous, non-limiting way an embodiment of an auxiliary slit of the circular sector type, enabling, when associated with an object slit such as that shown in...

...the invention shown in figure 3a in the case where the image of the treatment laser beam is moved either in rotation or in translation,

- figure 4b shows a particularly advantageous...

...of the embodiment of the device from figures 3a and 4a, the image of the laser beam being moved in translation,

- figure 4c shows a particularly advantageous object slit enabling treatment of hypermetropia by keratomileusis sin the case of the embodiment of the device from figure 4a, the image of the laser beam being moved in translation,
- figure 4d shows in a non-limiting way an alternative...

...in the same way as in the case of figure 3e,

- figure 4e shows a particularly advantageous embodiment in which at least one edge of the slit is adjustable to enable compensation of irregular distribution of the energy of the laser beam,
- figure 5a shows in the case of use of the device from figure 4a with the image of the laser beam moved in translation the area of the cornea subjected to irradiation in two elementary...

...extending in two directions OX, OY, the areas defined by movement in translation of the laser beam in the corresponding direction OX or OY being concurrent ,

- figure 5b shows a profile characteristic of total ablation of a cornea subjected to treatment for...

...total ablation of a cornea subject to treatment for hypermetropia by keratomileusis,

- figures 6a and 6b show a non-limiting embodiment of a diaphragm enabling improved focussing of images of the...

...accordance with the invention.

Prior to the description proper of the device for refractive surgical laser treatment of the cornea of the eye in accordance with the invention, there follow preliminary remarks summarising the effects of excimer laser light irradiation at a wavelength of 193 nanometres when such radiation is applied to the...

...axis, this axis being graduated in micrometres, as a function of the energy density per laser illumination pulse , the abscissa axis being graduated in millijoules /cm(sup 2).

The discrete elementary ablation curve is characterised by the presence of a...

...discrete elementary ablation is small, lying between 0.25 and 1 (mu)m.

The refractive eye surgery device in accordance with the invention is, in its essentials, advantageously based on a discrete ablation. Although the discrete elementary ablation caused by a laser illumination pulse features the previously mentioned non-linearity with regards to its depth as a function of the energy density, it is assumed (providing that the energy density is constant from one pulse to another) that the resulting total ablation at a fixed point for a given number n of consecutive pulses is equal to n times the average ablation corresponding to a single pulse . Thus the discrete elementary ablation corresponding to the aforementioned average ablation is denoted:

/a(e) (1)

This average ablation corresponds substantially for a laser illumination pulse with an energy density in the order of 200 millijoules /cm(sup 2) to a depth of ablation corresponding to the step in the curve...

...surface in question, in this instance the cornea. In this case, and by way of simplification , and in line with what the practitioner will have to do in any event to carry out the operation using...

...device in accordance with the invention, it is advantageous to take as the reference directions OX and OY the principal astigmatism directions as previously defined. The aforementioned directions OX and OY are then contained in the aformentioned astigmatism planes. The radius of curvature of the cornea COR is in this case a function of the azimuth angle denoted b, the radius of curvature r of the cornea after the operation for example satisfying the equation:

r (b) = r(sub(x)) Cosb + r(sub(y)) sinb (4)

In equation (4), b represents the azimuth angle of any plane containing the optical axis OZ, the...OX. The values r(sub(x)) and r(sub(y)) are the corresponding values of the radius of curvature r for b = 0 and b = (pi)/2, respectively.

In the case of keratomileusis for myopic astigmatism, research has shown that the ablation profile may be written (the OX and OY axes having been determined as previously...

...defined by: (see image in original document)

The terms A(sup(x)(sub 0) and A (sup(y)(sub 0) are themselves defined as functions of the parameters R, r(sub(x)) and r(sub(y)) by equations (7) and (8) below: (see image in original document)

Generally speaking, iso-ablation curves are ellipses.

A more detailed description of the device in accordance with the invention for performing refractive surgery on the eye by laser treatment of the cornea will now be given with reference to figure 3a.

Referring to the aforementioned figure, the device in accordance with the invention comprises means 1 for emitting a laser beam denoted FL. The laser beam FL is a pulsed laser beam.

The means for emitting the laser beam FL are preferably an excimer laser emitting radiation at a wavelength of 193 nanometres. The emission means 1 preferably emit laser pulses with an energy level of the laser beam FL in the order of 180 millijoules per pulse , the repetition frequency of the laser pulses being in the order of 20 Hz . The duration of each pulse is in the order of 10 nanoseconds and the instantaneous power of each pulse reaches high values, in the order of 10 MW.

As further seen in figure 3a, the device in accordance with the invention comprises means 2 for generating a treatment laser beam denoted FLT comprising at least one lobe denoted L1 through L6 of elongate cross-section. In figure 3a the image of the treatment laser beam FLT has been shown to a larger scale, it being possible to show this ...

...for focussing the image of the lobe or lobes L1 through L6 of the treatment laser beam FLT on the area of the eye OE to be corrected, on the cornea of the latter. Of course, the means 2 for generating the treatment laser beam FLT and the means 3 for focussing the image cause a loss of energy of the laser pulses of the laser beam FL, but the energy delivered to the cornea COR is in the order of 5 millijoules per pulse . The energy density on the image of the lobes of the laser beam generated by the means 3 for focussing the image of the aforementioned lobes is in the order of 200 millijoules /cm(sup 2) as

previously explained.

According to an advantageous aspect of the device in...

...invention, means 4 for moving the image of the lobe or lobes of the treatment laser beam FLT are provided for moving the aforementioned image over the area of the eye OE to be corrected.

Means 5 for synchronising the displacement of the image of the lobe or lobes of the treatment laser beam FLT over the area of the eye to be corrected are provided to ensure synchronisation with the pulses of the treatment laser beam.

Although the precise mechanism of the ablation process is still the subject of research, in some aspects it may be regarded as similar to a micro-explosion causing by photodecomposition a discrete elementary ablation by each laser pulse . The total correction or ablation resulting from implementation of a method of using the device of the invention is effected by summation of a plurality of elementary discrete ablations.

According to another advantageous characteristic of the device in accordance with the invention shown in figure 3a, the means 3 for focussing the image of the lobe or lobes L1 through L6 of the treatment laser beam FLT make it possible to focus the aforementioned image in such a way that the generatrix of an end of the lobe or lobes or the axis of longitudinal symmetry of the aforementioned lobe or lobes of the treatment laser beam are coincident with the optical axis OZ of the eye to be treated. Of course, as shown in figure 3a, the device in accordance with the invention may advantageously comprise an alignment device denoted 6 consisting, for example, of an auxiliary laser emission device such as a low-power helium-neon laser enabling the practitioner to carry out the appropriate adjustments of the focussing means 3 relative to the optical axis OZ of the eye OE of the patient.

According to another advantangeous characteristic of the device in accordance with...

...the means 4 for displacing the image of the lobe or lobes of the treatment laser beam over the area of the eye to be corrected make it possible to displace...

...generatrix or the longitudinal axis of symmetry of the lobe or lobes of the treatment laser beam FLT.

According to an advantageous aspect of the device in accordance with the invention, the latter enables the aforementioned rotation by increments of the angle of rotation denoted (GAMMA).

In one specific embodiment of the device in accordance with the invention shown in figure 3a, the means 2 for generating the treatment laser beam FLT may advantageously comprise a focussing optical system 20. The focussing optical system 20 may consist of a Galilean telescope producing from the laser emission means 1 a laser beam FL of regular (for example cylindrical) cross-section.

According to another particularly advantageous aspect of the device in accordance with the invention, the means 4 for displacing the image of the lobe or lobes of the treatment laser beam in rotation may comprise, as shown in figure 3a, a mask or diaphragm 21 incorporating an object slit denoted 211 . Of course, the object slit 211 is of elongate shape and illuminated, for example in parallel light, by the laser beam FL. One end of the object slit 211 is disposed, for example, at the centre of the diaphragm 21 and generates the aforementioned end generatrix of the treatment laser beam FLT or the longitudinal axis of symmetry of the lobes L1 through L6 of the treatment laser beam FLT.

The object slit 211 and the image of this object slit are rotated by drive means 40, 41 for rotating the mask or diaphragm 21.

Of course, but not in any limiting way, the...

...stepper motor 40 the drive shaft of which is fitted with at least one toothed wheel 41 meshing with the toothed ring 210.

To focus the image of the lobe or lobes of the treatment laser beam FLT, the focussing means 3 advantageously comprise a semi-reflecting

mirror 30 consisting of a prism or the like, for example, serving by total reflection to transmit the treatment laser beam FLT and the alignment beam delivered by the alignment means 6, together with a...

...objective lens of the device. The combination of the semi-reflecting mirror 30 and the focussing lens 31 serves to form the image of the treatment laser beam FLT on the area of the cornea to be treated, of course.

In a conventional way, all of the device in accordance with the invention and in particular the means 2 for generating the treatment laser beam FLT and the laser emission means are mounted on an optical bench and the focussing means 3 are mounted...

...the diaphragm enabling operations as previously described herein by means of the image of the laser beam lobe moved in rotation over the area of the eye to be treated will now be given with reference to figures 3b, 3c, 3d and 3e.

One embodiment of the object slit 211 of the diaphragm...

...operation by keratomileusis for myopia, the image of the lobe or lobes of the treatment laser beam FLT being rotated about the optical axis OZ of the eye to be treated...

...object slit, for generating the end generatrix or the axis of symmetry of the treatment laser beam FLT with for radius the corresponding value (rho) of the distance from a point...

...of the slit or lip of the object slit or of the lobe of the laser beam to the aforementioned centre.

In figure 3b it will be noted that the object...

...the increment of angular rotation as previously mentioned. It will be noted that equation (9) represents the equation in polar coordinates of one of the lips of the slit, the other...

...operation is conducted by rotating the image of the lobe or lobes of the treatment laser beam FLT will also be described with reference to figure 3c.

In this case, as...

...curvature of the latter becoming convex and decreasing regularly up to the end of the slit corresponding to the maximum logitudinal dimension of the latter. This continuous decrease in the aperture...

...1), 211(sub(i)) through 211(sub(n)), in the aforementioned figure. Each elementary object slit generates a corresponding lobe of the treatment laser beam FLT, of course. The number of slits in the same diaphragm 21 is limited only by the maximum aperture (theta)(sub(max)) of the object slit...of rotation. Each of the slits generates in this way one lobe of the treatment laser beam FLT. In the case of slits used for treatment of myopia by keratomileusis, adjacent...

...vice versa. The choice of the angular increment (GAMMA) and the maximum aperture angle (theta)(sub (max)) are governed by the following considerations :

A narrow slit corresponding to a small angular increment (GAMMA) enables use of a small part of the laser beam FL with the possibility of choosing the most homogeneous part of the latter, use of a low-power laser and also irradiation of a small part of the cornea by each pulse . Furthermore, increasing the number ND of slit images that are totally separated or at worst...

...to say the parameter R defined by the practitioner,

- the type of correction or operation carried out, that is to say keratomileusis for myopia or hypermetropia,

- the maximum aperture angle (sup((theta))max appropriate to the type of correction or operation carried out.

For optimum performance of the operation , the device in accordance with the invention comprises means 8 for calculating the angular rotation...

...in original document)

The calculation means 8 are then used to determine the number of laser emission pulses NI, this number of laser pulses being denoted N1(sub 1) in the case of treatment of myopia by keratomileusis. The number NI(sub 1) of laser emission pulses satisfies the equation: (see image in original document)

In the aforementioned equation ND(sub 1...

...slits can be irradiated in the aforementioned interval (tau)(e). In practice, the type of laser used to produce the laser pulses and the maximum speed of displacement of the slit may limit the frequency at which the pulses can be delivered .

The refractive eye surgery device using laser illumination in accordance with the invention may also be used to correct astigmatism of the...circular symmetry of the cornea the device in accordance with the invention may comprise as shown in figure 3e at least one auxiliary diaphragm 21 provided with an object slit 211...

...device may comprise upstream of the focussing means 3, on the path of the treatment laser beam FLT, an anamorphic optical system 9 in which the magnification depends on the azimuth...

...Thus the iso-energy curves in the object plane of the anamorphic system, that is to say of the object slit 211, are circles and the images of these circles given...

...anamorphic system 9 may consequently comprise two cylindrical lenses the longitudinal axes of which are orthogonal and respectively oriented to define the corresponding directions OX and OY, the lenses having respective...

...and M(sub(y)). These anamorphic optical systems as such are prior art and because of this they will not be described in more detail in this description.

Of course, to facilitate the work of the practitioner the device in accordance with the invention may be provided with an auxiliary...

...faced meniscus for epikeratothakia, or removal of a parallel surface corneal disc from a donor or removal of a surface to be modified by the laser for correcting myopia or hypermetropia, with a view to carrying out lamellar grafting. The lamellar...

...be carried out with constant rotation increments (GAMMA), the ablation obtained during this operation corresponding to that of a locally parallel faced meniscus the edges of which are substantially rectilinear .

An alternative embodiment of the device in accordance with the invention more particularly adapted to...

...will be described with reference to figure 4a.

In the embodiment shown in the aforementioned figure , but in a non-limiting way, the means 4 for displacing the image of the lobe or lobes of the treatment laser beam FLT over the area of the line to be treated provide for displacement in translation in a direction d substantially perpendicular to the largest dimension denoted Oz of the lobe of the treatment laser beam FLT. In this case, as will be described in more detail later in this description, the treatment laser beam FLT may be advantageously comprise two lobes or component parts of a single lobe symmetrical relative to a centre of symmetry denoted O .

According to an advantageous characterstic of the device in accordance ...

...as defined previously in figure 2a.

The means 4 for displacement in translation of the image of the lobe or lobes of the treatment laser beam FLT advantageously provide for displacement in translation of the latter in the orthogonal directions...

...the means 4 for displacing the image of the lobe or lobes of the treatment laser beam FLT in translation may comprise in succession along the path of the laser beam FL: a fixed diaphragm denoted 21 comprising at least one object slit 211 of...

...illuminated with parallel light. As shown in a non-limiting way in figure 4a, the laser beam FL may be generated by the means 1 previously described in relation to figure 3a, the laser beam FL possibly having a rectangular cross-section obtained in the classical way by passing the emitted laser beam through suitable diaphragms. Of course, as shown in figure 4a, a lens 20, a direction-changing mirror 21 such as a semi-reflecting mirror enabling under conditions analogous to those of figure 3a transmission of an auxiliary alignment laser beam not shown in this figure and a field lens 22 are used to conduct the parallel light laser beam FL to the slit 211 in the diaphragm 21.

Moreover, as also shown in...

...and to the diaphragm 21 so that the object slit 211 is in the object focal plane of the lens 23 to generate the lobe or lobes of the beam imaging...

...in question through an angle a rotates the emergent light beam, i.e. the treatment laser beam FLT, through an angle 2a.

Also, a second focussing lens 430 serving as an objective lens is movable in translation in the previously mentioned directions OX and OY.

It will be understood that the embodiment of the device in accordance with the invention shown in figure 4a is particularly advantageous in that it enables two methods to be used: in the first the treatment laser beam FLT is scanned in rotation, the focussing lens 430 being held in a fixed...

...on the optical axis OZ of the eye, of course, the prism 420 then being rotated to obtain the corresponding scanning of the treatment laser beam; in the second method, with the prism 420 fixed in position, the treatment laser beam emerging from the prism 420 is directed along the optical axis OZ of the eye and the focussing lens 430 produces corresponding movement in translation of the treatment laser beam FLT by corresponding defocussing due to movement of the lens 430 in translation in...

...may be provided between the lens 430 and the eye of the patient to limit the luminous intensity received by the eye OE of the patient. It may be disposed in...

...eye. Of course, other direction-changing mirrors can be provided on the path of the laser beam FL to obtain an appropriate optical path to enable unrestricted circulation of persons in...

...with the invention in figure 4a is particularly advantageous in that, over and above any possible operation by scanning the area of the eye to be treated in rotation, it also makes it possible to carry out this operation by scanning the laser beam over the area of the eye to be treated in translation, in particular in the previously mentioned two directions OX and OY. The lobe or lobes of the laser beam and the beam direction Oz being oriented in the OY direction, the scanning in...

...orients the aforementioned direction Oz with the OX direction for

subsequent movement of the treatment laser beam FLT in the direction perpendicular to the new orientation of the Oz axis, i...

...the diaphragm 21 and consequently the image of the lobe or lobes of the treatment laser beam FLT for treatment and correction by keratomileusis of myopia and astigmatism has a substantially...

...represents the transverse dimension of the object slit or of the lobe of the treatment laser beam at the abscissa z on the longitudinal reference axis oriented relative to the slit. The...is required to displace the image of the object slit 211 in translation along a direction at least perpendicular to the longitudinal axis O z of the object slit 211. Of...

...displacement in translation of the object slit 211 or of the lobe of the treatment laser beam in the direction OY or in the direction OZ.
A description of an object...
...correction of the cornea by keratomileusis for hypermetropia and hypermetropic astigmatism will also be given with reference to figure 4c.
In the case of the aforementioned operation, the object slit 211 and the corresponding lobe or lobes of the treatment laser bean FLT have a substantially parabolic profile satisfying the equation: (see image in original document...

...description.
Also, in the embodiment shown in figure 4a, the device in accordance with the invention also comprises means 8 for calculating the number of laser emission pulses denoted NI(sub 2) and the number of translation displacements increments (DELTA)u in the direction OY, OX. The number NI(sub 2) of pulses satisfies the equation: (see image in original document)
In this equation ND(sub 2) represents...

...in translation the object slits, whether they generate one or more lobes of the treatment laser beam FLT scanned in rotation or in translation, may advantageously comprise a curvilinear shape edge...211(sub 1), 211(sub 2) and 211(sub 3) have been shown by way of non-limiting example. The various object slits are spaced in a direction perpendicular to their...

...previously with reference to figures 3b, 3c, 3d, 4b, 4c and 4d.
To give a non -limiting example, in the case of an object slit such as that shown in figure...

...an optical system offering variable magnification so that from a particular design of object slit the practitioner is in a position to choose the final dimension of the image of the lobe or lobes of the treatment laser beam FLT given by the aforementioned object slits.
In accordance with another advantageous characteristic of...

...distribution of the light energy over the cross-section of a lobe of the treatment laser beam FLT.
As will be noted in figure 4e, the variable slit 211 may comprise...

...figure 4d, for example, the image of the slit or the lobe of the treatment laser beam FLT being displaced in a direction perpendicular to the longitudinal axis O z in...only and the other a function of Y only. In equations (29) and (30), r(sub (x)) represents the radius of curvature of the cornea in the direction OX and r...
...radius of curvature of the cornea in a meridian direction at the azimuth angle b previously mentioned.
Adopting the following notation: (see image in original document) (see image in original document...

...along two orthogonal directions produces an optimal effect where the areas scanned by the treatment laser beam FLT in the aforementioned directions intersect, that is over a square in plane projection...

...a substantialy circular area it is possible to extend the lateral scanning of the treatment laser beam FLT while modulating the displacement increment (DELTA)u between two adjacent positions, the aforementioned...

...not modify the profile along an axis parallel to OX, but deepens it uniformly (Y = constant) in particular by an amount A(sup(Y)(sub 0) over all of the axis...

...sup(Y)(sub(X)) corresponding to the values of equation (37) for the values of X included in the areas F and H.

The working method previously described with a slit procuring scanning of the treatment laser beam FLT in translation or using a slit with a parabolic profile as explained previously in this description thus yields an ablation profile which over the periphery of the...cornea COR beyond an area of radius R it is possible to mask the latter with a mask comprising a circular hole of radius R.

There are shown in figures 5b...

...with no astigmatism and a profile characteristic of keratomileusis ablation for hypermetropia.

In figures 5b and 5c units have not been marked on the coordinate axes. In the case of an...

...overcome the limitations of prior art devices through the use of an illumination and treatment laser beam the specific shape and displacement of which are computed so that their combination produces the required ablation shape.

When the slit or slits is or are irradiated by a particular pulse from the laser the image of the slit(s) projected onto the cornea COR is, so to speak, etched on to...

...with the mathematical laws previously established produces the required modification to the shape of the cornea .

Unlike the prior art devices, in which the concepts of illumination time were involved, the concepts of the laser pulse frequency and of the speed of displacement of the object slit (or its image) are...

...the concepts of linear or angular increments, as appropriate, between two adjacent positions of the image or of the lobe of the treatment laser beam. Here "adjacent" is to be understood in the geometrical rather the temporal sense. In other words, the fact that two geometrically adjacent, that is to say geometrically consecutive, elementary ablations are temporally consecutive is not relevant...

...concept of a threshold relating to each elementary ablation serves through summation of the elementary ablations in question to obtain a corrected or treated surface that is particularly satisfactory and the...

...the optical axis of the eye to be treated. The cross-section of the treatment laser beam FLT is of elongate shape, of course, and in a particularly advantageous way has at least one or several lobes as defined previously. The generatrix at the end of the treatment laser beam or the corresponding lobe coincides with the rotation axis O in figure 2a. The...

...about the axis O. To obtain the required correction the cross-section of the treatment laser beam FLT, the energy density per unit surface area of which is substantially constant, has...

...as shown in figure 4a, the resulting total ablation is obtained by

scanning the treatment laser beam FLT in translation by successive linear increments. The displacement takes place in the direction perpendicular to the longitudinal dimension of the largest dimension of the lobe of the laser beam FLT and perpendicular to the optical axis O of the eye OE. Several operations...

...complete treatment.
Of course, and in a non-limiting way, it is possible to carry out several operations, for example, the treatment laser beam FLT undergoing after each pass a rotation of a fraction of a circle about...

...parabolic cross-section the lobes of which have a parabolic shape as described previously, the laser beam being scanned in two passes along two perpendicular directions.
Compared with rotational scanning of the treatment laser beam FLT, scanning in translation for correction of myopia avoids a problem specific to rotary of elliptical rather than circular symmetry.
The translational scanning treatment laser beams may of course be used in various ways, the beams with different orientations being...

...example, symmetrical to a plane P orthogonal to the longitudinal axis O(''')x, this plane containing the directions O(''')y and O(''')z orthogonal to the direction of the longitudinal axis...

...a circular surface of radius R(min) and the object slit 211 as shown in figure 6c is illuminated by the laser beam FL. The longitudinal axis O(''')x and the transverse axis P(''')y of the...

...OX, OY of the cornea COR, these principal directions having been determined beforehand by the practitioner .
The device in accordance with the invention further comprises drive means 400 for rotating the diaphragm...

...function A(X,Y) defined by equation (34) and is proportional to the number of pulses received for an elementary displacement less than E(min)(a,(phi)) and therefore less than...

...OX divided by the elementary displacement (DELTA)x(a) (along the OX axis) for each laser pulse , we may write:
X(a)=Rsin(phi) Cosa and ((delta)X/(delta)a). da =
((delta)/(delta)a)Rsin(phi)Cosada = - Rsin(phi) Sina da
and (DELTA)X(a) = R sin (phi) sina(DELTA)a

whence (see image in original document)
Given the chosen ablation function...

...by equation (34) above, OX and OY are chosen such that Rx <= Ry and R is chosen such that R = Ry as shown in figures 6d and 6e in particular.
Using the same notation as previously, the ablation function may be written: (see image in original document)
Given the equations:
X = R...

...as shown in figure 3a or in figure 4a the calculation means 8 may comprise a microcomputer 80 with its peripheral devices. The memory areas of the microcomputer store programs and/or subroutines for calculating the numbers of laser pulses NI(sub 1), NI(sub 2) previously mentioned in the description, the total irradiation times T(sub(1min)), T(sub(2min)), and sub- routines for sequencing and synchronising the displacement of the treatment laser beam FLT. These sequencing programs are used, for example, to generate rotation or translation displacement commands scdr and scdt and laser emission commands sce. The program or subroutine can also include a program for modulating the...

...increment (DELTA) a.
To facilitate the work of the practitioner the microcomputer 80 may further comprise in its memory area a "menu" type program inviting the practitioner, through an interactive type dialogue, to define at least the principal directions of astigmatism of the...

...advantageously also invite the practitioner to specify the value of the parameter R defining the optical area for operation and correction of the cornea COR. It may also invite the practitioner...

...for synchronising the displacement of the image of the lobe or lobes of the treatment laser beam FLT. The means 5 for synchronising the displacement of the image may advantageously comprise an input/output interface circuit generating from rotation or translation displacement commands...

...commands sce respective commands SCDR, SCDT, SCE for the displacement control means 4 and the laser emission means 1. The input/output interface circuit will not be described in detail, as...

...3d, 3e, 3f, 4b, 4c, 4d, 4e, 6a, 6b, and 6c.
There has thus been described a device for performing surgery on the cornea in which rotational or translational scanning of a laser beam having at least one lobe of elongate cross-section produces a precise law of ablation over the area of the cornea COR of the eye to be corrected. Laboratory tests have shown that, compared with prior art devices in which the depth of ablation was controlled by the time of exposure to the treatment laser beam, the corrected surfaces after treatment, that is to say the surfaces of the cornea serving as the input optical surface of the eye of the patient, show a much reduced degree of roughness, thus conferring superior optical...

...that the degree of roughness of the surfaces after treatment does not exceed 1 (mu) m . The degree of roughness of the corneal surfaces after treatment with the prior art devices may be explained by the fact that these devices have the disadvantage of applying the laser emission power simultaneously to the major part of the cornea, the effect of which is to create an acoustic shock wave resulting from simultaneous vapourising of material over the anterior surface of...
...This kind of phenomenon can also have unwanted physiological consequences, such as ejection of endothelium cells , for example. The device in accordance with the invention makes it possible to eliminate the...

...in accordance with the invention is used results from the summation of elementary ablations distributed over the cornea according to precise mathematical laws, each elementary ablation being carried out with minimal energy density.
Of course, the device in accordance with the invention is not limited to refractive eye surgery . It may also constitute a device for shaping or correcting the shape of an object by laser treatment of the surface of the object. In this case, the device comprises the means 2 for generating a treatment laser beam FLT comprising at least one lobe L1 ... L6 of elongate cross-section and means 3 for focussing the image of the lobe or lobes of the treatment laser beam FLT onto the area of the object OE to be corrected. The means 4 for moving the image of the lobe or lobes of the treatment laser beam FLT over the area of the object to be corrected serve to move the latter over the area of the object to be corrected. The means 5 for synchronising movement of the image of the lobe or lobes of the treatment laser beam FLT over the area of the object OE to be corrected with the treatment laser beam pulses serve to perform the correction or shaping by summing a plurality of elementary discrete ablations. As shown in figure 7, the image of the lobe or lobes of the laser beam is focussed in such a way that the generatrix of one end of the lobe or lobes or the longitudinal axis of

symmetry of a lobe or the lobes of the laser beam FLT is coincident with the axis of symmetry OZ of the object to be...

...The means 4 for moving the image of the lobe or lobes of the treatment laser beam FLT over the area of the object to be corrected serve to move the image of the lobe or lobes L1 ... L6 of the laser beam in rotation about the end generatrix or the longitudinal axis of symmetry of the lobes of the treatment laser beam FLT. The rotation is applied in rotation angle increments. The device corresponds substantially to the embodiment of figure 3a.

Furthermore, in an embodiment corresponding to that of figure 4a of a device for shaping or correcting the shape of an object by laser treatment, the means 4 for moving the image of the lobe or lobes of the treatment laser beam FLT over the area of the object to be treated provide for movement in...

...direction d substantially perpendicular to the largest dimension 0z of the lobe of the treatment laser beam FLT. The movement in translation may be effected in displacement increments (DELTA)u, the movement in translation being defined by u = X or u = Y defining a plane tangential to the surface of the object OE at...

...the invention for shaping or correcting the shape of an object or for performing refractive eye surgery will be described with reference to figure 7, this embodiment being based on the embodiment...

...1002 viewing the object or the eye OE to be treated and transmitting image data to the calculation means 8. The video cameras 1001, 1002 allow for monitoring the progress of the...

...shown in figure 7, a series of mirrors M1, M2, M3, M4 deflect the treatment laser beam FLT. At least one of these mirrors, the mirror M4, is mounted on a...

...the correction or treatment during the process and to control the deflection of the treatment laser beam FLT by means of the mirror M4 in the event of uncontrolled movement of...

...shape of mechanical objects such as contact lenses or intra-ocular implants and for refractive eye surgery .

...CLAIMS B1

1. Device for shaping the shape of an objects (OE) laser ablation of a surface of said object (OE) according to an ablation function, said device comprising:
   - means (1) for generating a pulsed laser beam (FL) having pulses and an energy density,
   - slit means (21) having at least one slit (21) intercepting said laser beam (FL), said at least one slit (211) having a profile function proportional to said ablation function,
   - means (3) for forming an image of said at least one slit (211) onto an area of said surface of said object (OE),
   - means (4) for displacing said image of said at least one (211) over said area by steps of a given increment, corresponding to elementary discrete ablations of said surface of said object (OE),
   - means (5) for synchronizing said increment, said pulses and said energy density, so that the total ablation resulting from the summation of said elementary discrete ablations meets said ablation function.
2. Device according to claim 1, wherein said at least one slit (211) has an adjustable profile function to...

...of irregular distribution of said energy density in the cross section of intercepted portion of said laser beam (FL).

3. Device according to claim 2, wherein said at least one slit (211...

...of strips (2110) mobile in translation, in a direction perpendicular to the longitudinal axis of said slit (211).

4. Device according to claim 1, wherein said ablation function being defined by a function A(h) having a symmetry of revolution about an axis (Oz) perpendicular to said surface of said object (OE), h being the distance to said axis (Oz), said profile function of said at least one slit (211) in a polar ((rho), (theta)) coordinate system...

...equation :
(GAMMA) is an angular rotation increment,
/a(e) represents the average thickness removed by irradiation of each laser pulse .

5. Device according to claim 4, wherein an anisotropic ablation function A (h , b) is obtained by modulating said angular rotation increment (GAMMA) as a function of azimuth angle b about said axis (Oz): (see image in original document)

6. Device according to claim 4, further comprising means (8) for calculating the angular rotation increment (GAMMA) which satisfies the equation : (see image in original document) in which equation :
(theta)(sub(max...

...to claim 4, further comprising means (8) for calculating the number NI(sub 1) of laser pulses and the number of rotation increments (GAMMA) , the number NI(sub 1) of pulses satisfying the equation : (see image in original document) in which equation :
ND (sub(I)) represents the number of totally separate or adjacent images of said at least one slit (211),
A(sub(o)) is the maximum value...

...time interval between two successive irradiations of a same point of said area.

9. Device according to claim 4, wherein said means (4) for displacing said image of said at least one slit (211) comprise :
. a diagram (21) comprising said at least one slit (211),
. drive means for rotating said diaphragm (21), comprising a toothed ring (210) disposed at...

...41) meshing with said toothed ring (210).

10. Device according to claim 5, for refractive eye surgery , wherein said surface of said object (OE) is the external face of the cornea (COR), and wherein to compensate...

...symmetry of revolution of said cornea (COR), said device comprises means (8,5) for modulating said angular rotation increment (GAMMA) as a function of said azimuth angle b = (see image in...

...in the direction with azimuth angle b.

11. Device according to claim 4, for refractive eye surgery , wherein said surface of said object (OE) is the external face of the cornea (COR) and wherein to compensate for astigmatism of the eye by re-establishing the symmetry of revolution of said cornea (COR), said means (3) for forming an image of said at least one...

...azimuth angle b about said axis (Oz).

12. Device according to claim is, for refractive eye surgery , wherein said surface of said objects (OE) is the external face of the cornea (COR) and wherein to compensate for astigmatism of the eye by re -establishing the symmetry of revolution of said cornea (COR), said device comprises at least one auxiliary diaphragm with an object slit (211) of circular arc shape with a specific radius of curvature.

13. Device according to claim 4, for refractive eye surgery , wherein said surface of said object (OE) is the external face of the cornea (COR14. Device according to claim 4, for refractive eye surgery , wherein said surface of said object (OE) is the external face of the cornea (COR) and wherein, for treatment...

...direction v.
/a(sub(u))(e) represents the average thickness removed by irradiation of each laser pulse in the u direction.
16. Device according to claim 15, wherein said at least...

...irregular distribution of said energy density in the cross section of intercepted portion of said laser beam (FL).
17. Device according to claim 16, wherein said at least one slit (211...

...the equation: (see image in original document) in which equation =
E(sub(max)) represents the maximum width of said profile function of said at least one slit (211).
A(sub(u...

...according to claim 15, further comprising means (8) for calculating the number NIv/2 of laser pulses and the number of translation displacement (DELTA)(sub(v)) in the v direction, the number NIv/2 of pulses satisfying the equation: (see image in original document) in which equation:
NDv/2 represents the number of totally separate or adjacent images of said at least one slit (211) in the v direction,
Ao/u is the maximum value of said ablation function.
20. Device according to claim 19, further comprising means (8) for calculating the minimum total irradiation time Tv/2(sub(min)) in the v direction which satisfies the equation: (see image in original document) in which equation:
(tau...

...of said first lens (23),
. a second focusing lens (430) mobile in translation in said translation displacement direction.
22. Device according to claim 21, further comprising a rotating prism (420) located...

...of said translation displacement direction about an axis of said surface of said object (OE).
23 . Device according to claim 22, wherein said means (4) for displacing said image of said at least one slit (211) enable displacement in translation of the latter in at least two orthogonal directions (OX,OY).
24. Device according to claim 23, for refractive eye surgery , wherein said surface of said objects (OE) the external face of the cornea (COR), and...

...the latter in two orthogonal directions OX and OY.
20. Device according to any one of claims 16 through 19, wherein the means for displacing the image of the lobe or lobes of the treatment laser beam in translation comprise in succession on the path of the laser beam:
- a fixed diaphragm comprising at least one object slit of elongate shape adapted to be illuminated by the laser beam,
- a first lens, the object slit being placed in the object focal plane of...

...a rotation of the prism through an angle a) rotation of the emergent light beam, the treatment laser beam, through an angle 2a, and
- a second focussing lens mobile in translation in the directions OX and OY.
21. Device according to any one of claims 16 through 20, wherein, for refractive eye surgery by laser treatment of the cornea , the image of the lobe or lobes of the treatment laser beam and the object slit of the diaphragm for treatment and correction by keratomileusis for...

...OY) are respectively oriented along the principal directions of astigmatism.

25. Device according to claim 22 , for refractive eye surgery , wherein said surface of said objects (OE) is the external face of the cornea (COR) and wherein, for treatment of myopia, said ablation function A(sub(u))(u) satisfies the equation: (see image in original document) in which equation:

A(sub (u)) (sup 0) is the maximum value of said ablation function,

R represents the radius of said cornea (COR).

26. Device according to claim 22, for refractive eye surgery , wherein said surface of said objects (OE) the external face of the cornea (COR) and...

...treatment of hypermetropia, said ablation function A(sub(u))(u) satisfies the equation: (see image in original document) in which equation:

A(sub(u))(sup 0) is the maximum value of...and O'''z orthogonal to the direction of said longitudinal axis O'''x, said profile function E((phi)) satisfying the equation:

E((phi)) = E (((pi)/2)) sin(sup 3)(phi)

in...

...one slit (211) for (phi) = (pi)/2.

29. Device according to claim 28 for refractive eye surgery wherein said surface of said objects (OE) is the external face of the cornea (COR...

...cornea (COR) and said at least one slits (211) adapted to be illuminated by said laser beam (FL), said longitudinal axis O'''x and said transverse axis O'''y of said...

...means (400,401,402) for rotating said diaphragm (21) about said axis O'''y, consisting of a stepper motor enabling said diaphragm (21) to be rotated in rotation increments (DELTA)a...

...a = (pi)/2. ransverse dimension of the slit or of the lobe of the treatment laser beam at the abcissa z on an axis of coordinates oriented longitudinally relative to the slit,

E(sub(max)) represents the maximal transverse dimension of the slit,

R represents the optical area on the cornea in which the cornea is operated on and corrected,

u represents...

...on displacement in translation of the object slit or of the lobe of the treatment laser beam in the direction OY or in the direction OX,

/a(e) represents the average thickness removed by irradiation by each laser pulse .

22. Device according to any one of claims 16 through 20, wherein, for refractive eye surgery by laser treatment of the cornea , the image of the lobe or lobes of the laser beam and the object slit of the diaphragm for treatment and correction by keratomileusis of...

...z) represents the transverse dimension of the slit or of the lobe of the treatment laser beam at the abcissa z on an axis of coordinates oriented longitudinally relative to the...

...slit,

R represents the optical area on the cornea in which the cornea is operated on and corrected,

u represents the abcissa or position on the coordinate axis oriented longitudinally relative to...

...on displacement in translation of the object slit or of the lobe of the treatment laser beam in the direction OY or in the direction OX.

23. Device according to any one of claims 1 or 5 through 8 or 13 or 15 or 21 or 22, wherein the object slits are formed on a diaphragm forming a curved surface.

24. Device according to claim 23, wherein the diaphragm comprises a semicylindrical surface...according to claim 24, wherein for correcting the cornea by keratomileusis for myopic astigmatism, the diaphragm having its concave side facing towards the cornea and the object slit being illuminated by the laser beam, the longitudinal axis O(''')x and the transverse axis O(''')y of the diaphragm being oriented in the principal directions of astigmatism OX, OY...

...consist in a stepper motor enabling the diaphragm to be rotated in rotation increments (DELTA) a satisfying the equation: (see image in original document) in which equation:

- a represents the inclination...

...21 or claim 22, further comprising means for calculating the number NI(sub 2) of laser pulses and the number of translation displacement increments (DELTA)u in the direction OY or OX, the number NI(sub 2) of pulses satisfying the equation: (see image in original document) in which equation ND(sub 2) represents the number of totally separate...

...to enable compensation of irregular distribution of energy in the cross-section of the treatment laser beam or a lobe thereof.

35. Device according to claim 34, wherein the adjustable slit...

...programs and/or subroutines for calculating the numbers NI(sub 1), NI(sub 2) of laser pulses and the total irradiation times T(sub(1min)), T(sub(2min)), for sequencing and synchronising the displacement of the treatment laser beam, for generating commands for displacement in rotation or translation and laser emission commands, this last program being stored in a main memory of the computer, and...

...means for synchronising displacement of the image of the lobe or lobes of the treatment laser beam comprise an input/output interface circuit producing from rotation and translation displacement commands and emission commands respective commands for the displacement control means and the laser emission means.

39. Device according to any one of the preceding claims, further comprising:

- real...

...shaping of the object during the process;

- a series of mirrors for deflecting the treatment laser beam one at least of which, referred to as the adjustment mirror, is mounted on...

...Use of the device according to any one of claims 1 through 39 for refractive corneal surgery .

43. Device for shaping or correcting the shape of an object by laser treatment of the surface of the object substantially as hereinbefore described with reference to any...

...CLAIMS B1

1. Einrichtung um die Form eines Gegenstandes (OE) durch Laser Ablation einer Oberflache des Gegenstandes (OE) entsprechend einer Ablationsfunktion zu gestalten, wobei die Einrichtung beinhaltet:

* Vorrichtungen (1) um einen gepulsten Laserstrahl zu erzeugen, der Pulse und eine Energiedichte hat,
* Blendenvorrichtungen (21) mit einem wenigstens einmal vorhandenen

Blendenausschnitt (211), der den...

...Ablationen der Oberflache des Gegenstandes (OE) entsprechen, zu verschieben,
* Vorrichtungen (5), um das Inkrement, die Pulse und die Energiedichte aufeinander abzustimmen, so das die gesamte Ablation, die sich aus der Summierung...
...CLAIMS B1
1. Dispositif de mise en forme d'un objet (OE) par ablation par laser d'une surface dudit objet (OE) selon une fonction d'ablation, ledit dispositif comprenant:
un moyen (1) de generation d'un faisceau laser pulse (FL) a impulsions et a haute densite d'energie,
un moyen de fente (21) comprenant au moins une fente (21) interceptant ledit faisceau laser (FL), ladite fente au moins unique (211) exercant une fonction de profil proportionnelle a ladite ...

...de ladite densite d'energie dans la section transversale de la partie interceptee dudit faisceau laser (FL).
3. Dispositif selon la revendication 2 dans lequel ladite fente au moins unique (211...

...de rotation angulaire
a(e) represente l'epaisseur moyenne enlevee par irradiation par chaque impulsion laser .
5. Dispositif selon la revendication 4 dans lequel une fonction anisotropique d'ablation A (h...
...en outre un moyen de calcul (8) du nombre NI(en indice(I)) d'impulsion laser et le nombre d'increment (GAMMA) de rotation, le nombre NI(en indice(I)) d...en indice(u))(e) represente l'epaisseur moyenne enlevee par un rayonnement de chaque impulsion laser dans la direction u.
16. Dispositif selon la revendication 15, dans lequel ladite fente au...

...de ladite densite d'energie dans la section transversale de la partie interceptee dudit faisceau laser (FL).
17. Dispositif selon la revendication 16, dans lequel ladite fente au moins unique (211...

...un moyen de calcul (8) du nombre NI(au indice(v)(sub 2) l'impulsion laser et le nombre de deplacement en translation v dans la direction v, le nombre NI...et ladite fente au moins unique (211) est apte a etre illuminee par ledit faisceau laser (FL), ledit axe longitudinal O'''x et ledit axe transversal O'''y dudit diaphragme (21...

?

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? show files;ds

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Set     Items   Description
S1     990770   LASER? OR LASER(S)PULSE?
S2      22391   (EYE? OR VISUAL(2N)ORGAN? OR RETINA? OR CORNEA? OR OPTIC? -
             OR OPHTHALM?)(5N)(SURGERY OR PROCEDURE?)
S3    2184841   REPET? OR RATE?
S4       6620   20(5W)(HERTZ OR HZ) OR 20 HZ
S5      19962   (MJ OR MILLIJOULE?) OR 10 MJ
S6        324   S1 AND S2 AND S3
S7        137   S4 AND S5
S8          3   S6 AND S7
S9       1675   10(5W)(MJ OR MILLJOULE?) OR 10 MJ
S10         0   S8 AND PY<1993
?
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? t s8/3,k/all

>>>KWIC option is not available in file(s): 77

8/3,K/1 (Item 1 from file: 8)
DIALOG(R)File 8:Ei Compendex(R)

04526528 E.I. No: EIP96073231045
Title: Biophysical considerations for optimizing energy delivery during Erbium:YAG laser vitreoretinal surgery
Author: Berger, Jeffrey W.; Bochow, Thomas W.; Kim, Rosa Y.; D'Amico, Donald J.
Corporate Source: Harvard Medical Sch., Brookline, MA, USA
Conference Title: Ophthalmic Technologies VI
Conference Location: San Jose, CA, USA Conference Date: 19960127-19960128
E.I. Conference No.: 22557
Source: Proceedings of SPIE - The International Society for Optical Engineering v 2673 1996.. p 146-156
Publication Year: 1996
CODEN: PSISDG ISBN: 0-8194-2047-6
Language: English

Title: Biophysical considerations for optimizing energy delivery during Erbium:YAG laser vitreoretinal surgery

Abstract: Er:YAG laser -mediated tissue disruption and removal results from both direct ablation and the acousto-mechanical sequelae...
...delivery for vitreoretinal surgical maneuvers. Experimental studies were performed with a free-running Er:YAG laser (100 - 300 microseconds FWHM, 0.5 - 20 mJ , 1 - 30 Hz). Energy was delivered by fiberoptic to a custom-made handpiece with a 75 - 600 micrometer...

...experimental and analytical data. The temperature rise in vitreous and model systems depends on the pulse energy and repetition rate , but is independent of the probe-tip diameter at constant laser power; at moderate repetition rates , the temperature rise depends only on the total energy (mJ) delivered. The maximum bubble diameter increases as the cube root of the pulse energy with a reverberation period of 110 microseconds and a maximum bubble diameter of 1.2 mm following one mJ delivery to saline through a 100 micrometer tip. Our modeling studies generate predictions similar to...

...data and predicts that the maximum bubble diameter increases as the cube root of the pulse energy. We demonstrate that tissue ablation depends on radiant exposure (J/cm**2), while temperature rise, bubble size, and pressure depends on total pulse energy. Further, we show that mechanical injury should be minimized by delivering low pulse energy, through small diameter probe tips, at high repetition rates . These results allow for optimization strategies relevant to achieving vitreoretinal surgical goals while minimizing the...

Descriptors: Laser surgery ; Ophthalmology ; Optimization; Laser tissue interaction; Fiber optic components; Laser ablation; Mathematical models; Bubble formation
Identifiers: Biophysics; Fiber optic energy delivery; Erbium lasers ; Vitreoretinal surgery ; Scaling laws

8/3,K/2 (Item 1 from file: 34)
DIALOG(R)File 34:SciSearch(R) Cited Ref Sci

06701094 Genuine Article#: ZL631 No. References: 47
Title: Photorefractive keratectomy and cataract

Author(s): Costagliola C (REPRINT) ; DiGiovanni A; Rinaldi M; Scibelli G; Fioretti F
Corporate Source: VIA F PETRARCA 41-A,/I-80122 NAPLES//ITALY/ (REPRINT); UNIV NAPLES FEDERICO II,EYE CLIN/NAPLES//ITALY/; UNIV NAPLES FEDERICO II,EYE CLIN/NAPLES//ITALY/
Journal: SURVEY OF OPHTHALMOLOGY, 1997, V42, 1 (NOV), PS133-S140
ISSN: 0039-6257 Publication date: 19971100
Publisher: ELSEVIER SCIENCE INC, 655 AVENUE OF THE AMERICAS, NEW YORK, NY 10010
Language: English Document Type: ARTICLE (ABSTRACT AVAILABLE)

...Abstract: epithelial cells, etc. Twenty of these animals then received PRK with energy delivered by excimer laser (pulse rate = 20 Hz , fluence 250 mJ /cm(2) number of pulses = 6032; cumulative UV dose = 1508 J/cm(2)). The other 20 animals were exposed to...

...levels of reduced and oxidized glutathione, hydrogen peroxide, ascorbic acid, and malondialdehyde were determined. Excimer laser -induced ultrastructural modifications of the lens, verified through scanning electron microscopy, were studied at the...
...Identifiers-- LASER CORNEAL SURGERY ; LENS EPITHELIAL-CELLS; EXCIMER- LASER ; ULTRAVIOLET-RADIATION; SUPEROXIDE-DISMUTASE; AQUEOUS-HUMOR; CYTO-TOXICITY; DNA DAMAGE; NM; RABBIT

8/3,K/3 (Item 2 from file: 34)
DIALOG(R)File 34:SciSearch(R) Cited Ref Sci

03557520 Genuine Article#: PM510 No. References: 18
Title: VITREORETINAL ABLATION WITH THE 193-NM EXCIMER-LASER IN FLUID MEDIA
Author(s): PALANKER D; HEMO I; TUROVETS I; ZAUBERMAN H; FISH G; LEWIS A
Corporate Source: HADASSAH UNIV HOSP,CTR LASER,POB 12000/IL-91120JERUSALEM//ISRAEL/; HEBREW UNIV JERUSALEM,DIV APPL PHYS/JERUSALEM//ISRAEL/; HEBREW UNIV JERUSALEM,HADASSAH UNIV HOSP,DEPT OPHTHALMOL/JERUSALEM//ISRAEL/
Journal: INVESTIGATIVE OPHTHALMOLOGY & VISUAL SCIENCE, 1994, V35, N11 (OCT) , P3835-3840
ISSN: 0146-0404
Language: ENGLISH Document Type: ARTICLE (Abstract Available)

Title: VITREORETINAL ABLATION WITH THE 193-NM EXCIMER- LASER IN FLUID MEDIA
Abstract: Purpose. To ablate retina and vitreous membranes using the 193-nm argon fluoride excimer laser in a fluid medium.

Methods. A special delivery system for the 193-nm excimer laser was developed that enabled the delivery of the laser into high-absorption liquid environments. The system was tested on the retina in an in...
...retina and vitreous membranes of rabbit eyes. The depth of cut as a function of laser energy was determined for an ablating needle with a 0.25-mm exit diameter.

Results...

...of vitreous membranes was obtained in an energy range of 0.075 to 0.25 mJ / pulse . At the energy level of 0.075 mJ / pulse , four pulses were required for full-depth cut formation in rabbit retina, whereas at energy levels greater than 0.17 mJ / pulse , one pulse was sufficient for full-depth cut formation. The maximal rate of cutting achieved for the bovine retina was 2 mm/sec at a 20 - Hz repetition rate of the laser . Ablation occurred only when the tip was held in

contact with the tissue.

Conclusions. The...

...Identifiers-- SURGERY; PHOTODECOMPOSITION; MICROSURGERY; MEMBRANES; CORNEA; LIGHT

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? *show files;ds*

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File  99:Wilson Appl. Sci & Tech Abs 1983-1999/Aug
         (c) 1999 The HW Wilson Co.
File 108:Aerospace Database 1962-1999/Aug
         (c) 1999 AIAA
File 144:Pascal 1973-1999/Aug
         (c) 1999 INIST/CNRS
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         (c) 1999 Reed-Elsevier (UK) Ltd.
File 305:Analytical Abstracts 1980-1999/Oct
         (c) 1999 Royal Soc Chemistry
File 315:ChemEng & Biotec Abs 1970-1999/Sep
         (c)1999 RoySocChm,DECHEMA,FizChemie

Set      Items   Description
S1      354443   LASER? OR LASER(S)PULSE?
S2       25810   (EYE? OR VISUAL(2N)ORGAN? OR RETINA? OR CORNEA? OR OPTIC? -
              OR OPHTHALM?)(5N)(SURGERY OR PROCEDURE?)
S3      768091   REPET? OR RATE?
S4        2246   20(5W)(HERTZ OR HZ) OR 20 HZ
S5        6552   (MJ OR MILLIJOULE?) OR 10 MJ
S6         172   S1 AND S2 AND S3
S7          68   S4 AND S5
S8           0   S6 AND S7
S9         535   10(5W)(MJ OR MILLJOULE?) OR 10 MJ
S10       8730   S4-S5
S11         27   S6 AND S10
S12          2   S11 AND PY<1993
S13          2   RD (unique items)
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rates I'm finding aren't in the correct range

? t s13/5/all

13/5/1 (Item 1 from file: 144)
DIALOG(R)File 144:Pascal

10022356 PASCAL No.: 92-0114769
Excimer laser smoothing of a reproducible model of anterior corneal surface irregularity
FASANO A P; MOREIRA H; MDDONNELL P J; SUNBAWY A
Univ. Southern California school medicine, Doheny eye inst., dep. ophthalmology, Los Angeles CA 90033, USA
Journal: Ophthalmology : (Rochester, MN), 1991, 98 (12) 1782-1785
ISSN: 0161-6420 CODEN: OPHTDG Availability: INIST-18914; 354000023256380040
No. of Refs.: 7 ref.
Document Type: P (Serial) ; A (Analytic)
Country of Publication: USA
Language: English Summary Language: English
A reproducible model of an irregular corneal surface was developed to test the ability of the excimer laser to treat such surfaces. Using a 193-nm argon fluoride excimer laser set at a fluence of 160 mJ/cm SUP 2 , repetition rate of 10 Hz, and 185 pulses, fresh de-epithelialized pig eyes underwent phototherapeutic ablations through a piece of stainless steel wire screen that masked the cornea. This yielded an uneven corneal surface in a grid-like pattern, with the peaks 50 mu m higher than the troughs. The eyes then underwent further treatment in an attempt to smooth the center of the irregularity

English Descriptors: Irregularity; Membrane surface; Cornea; Keratopathy; Experimental disease; Surgery; Treatment; Keratectomy; Laser; Excimer; Argon; Pathology; Exploration; Scanning electron microscopy; Pig; Animal; Eye disease
Broad Descriptors: Artiodactyla; Ungulata; Mammalia; Vertebrata; Artiodactyla; Ungulata; Mammalia; Vertebrata; Artiodactyla; Ungulata; Mammalia; Vertebrata

French Descriptors: Irregularite; Surface membranaire; Cornee; Keratopathie ; Pathologie experimentale; Chirurgie; Traitement; Keratectomie; Laser; Excimere; Argon; Anatomopathologie; Exploration; Microscopie electronique balayage; Porc; Animal; Oeil pathologie

Classification Codes: 002B25B

13/5/2 (Item 2 from file: 144)
DIALOG(R)File 144:Pascal

09643464 PASCAL No.: 91-0440588
A comparative study of masking fluids for excimer laser phototherapeutic keratectomy
KORNMEHL E W; STEINERT R F; PULIAFITO C A
Harvard medical school, Massachusetts eye ear infirmary, morse laser cent., Boston MA 02114, USA
Journal: Archives of ophthalmology : (1960), 1991, 109 (6) 860-863
ISSN: 0003-9950 CODEN: AROPAW Availability: INIST-2033; 354000014804670290/NUM
No. of Refs.: 15 ref.
Document Type: P (Serial) ; A (Analytic)
Country of Publication: USA
Language: English Summary Language: English

Several fluids of different viscosity were used to mask deeper tissues while exposing protruding irregularities during therapeutic keratectomy of an irregular anterior corneal surface with the 193-nm argon fluoride excimer laser. A model of an irregular anterior corneal surface was developed in deepithelialized calf eyes using grade 8-0 sandpaper. Therapeutic keratectomy was then performed on 28 eyes at a fluence of 180 mJ/cm SUP 2 , a repetition rate of 10 Hz, and 500 pulses per eye. Solutions of 0.3% hydroxypropylmethyl-cellulose 2910 and 0.1% dextran 70 solution, or 0.9% saline solution were applied to the corneal surface of 21 eyes

English Descriptors: Keratectomy; Treatment; Surgery; Eye disease; Laser; Excimer; Cornea; Surface; Fluid; Masking; Experimental study; Animal; Bovine; Isolated organ; Eye

Broad Descriptors: Artiodactyla; Ungulata; Mammalia; Vertebrata; Artiodactyla; Ungulata; Mammalia; Vertebrata; Artiodactyla; Ungulata; Mammalia; Vertebrata

French Descriptors: Keratectomie; Traitement; Chirurgie; Oeil pathologie; Laser; Excimere; Cornee; Surface; Fluide; Masquage; Etude experimentale; Animal; Bovin; Organe isole; Oeil

Classification Codes: 002B25B

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? show files;ds

File 155:MEDLINE(R) 1966-1999/Nov W4
         (c) format only 1999 Dialog Corporation
File  73:EMBASE 1974-1999/Sep W2
         (c) 1999 Elsevier Science B.V.
File 198:Health Devices Alerts(R) 1977-1999/Oct W1
         (c) 1999 ECRI-nonprft agncy
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File   5:Biosis Previews(R) 1969-1999/Aug W2
         (c) 1999 BIOSIS
File 162:CAB HEALTH 1983-1999/Aug
         (c) 1999 CAB INTERNATIONAL

Set      Items    Description
S1      157639    LASER? OR LASER(S)PULSE?
S2       75973    (EYE? OR VISUAL(2N)ORGAN? OR RETINA? OR CORNEA? OR OPTIC? -
              OR OPHTHALM?)(5N)(SURGERY OR PROCEDURE?)
S3     2499307    REPET? OR RATE?
S4        7642    20(5W)(HERTZ OR HZ) OR 20 HZ
S5       10546    (MJ OR MILLIJOULE?) OR 10 MJ
S6         758    S1 AND S2 AND S3
S7         107    S4 AND S5
S8          10    S6 AND S7
?
```

0 9 8 0 5 9 0 4 . 1 4 1 4 3 0 3 9 0

? t s8/5/all

8/5/1 (Item 1 from file: 155)
DIALOG(R)File 155:MEDLINE(R)

09539994 98264438
Photorefractive keratectomy and cataract.
Costagliola C; Di Giovanni A; Rinaldi M; Scibelli G; Fioretti F
Eye Clinic, II University of Naples, Italy.
Surv Ophthalmol (NETHERLANDS) Nov 1997, 42 Suppl 1 pS133-40, ISSN 0039-6257 Journal Code: VCT
Languages: ENGLISH
Document type: JOURNAL ARTICLE
JOURNAL ANNOUNCEMENT: 9808
Subfile: INDEX MEDICUS
Fifty male albino rabbits were studied. Ten animals served as controls. Forty animals were prepared to receive photorefractive keratectomy (PRK), including anesthesia, scraping of the corneal epithelial cells, etc. Twenty of these animals then received PRK with energy delivered by excimer laser (pulse rate = 20 Hz, fluence 250 mJ/cm2; number of pulses = 6032; cumulative UV dose = 1508J/cm2). The other 20 animals were exposed to the same operating microscope light as the PRK-treated animals, but they did not receive PRK. All three groups were divided into halves: the first half was immediately analyzed at 0 time, and the second half was observed 1 year later. Samples of aqueous humor and lens were analyzed. The levels of reduced and oxidized glutathione, hydrogen peroxide, ascorbic acid, and malondialdehyde were determined. Excimer laser-induced ultrastructural modifications of the lens, verified through scanning electron microscopy, were studied at the same intervals. Immediately after PRK, the biochemical parameters studied, both in aqueous humor and in lens of treated animals, showed significant differences. One year later, the observed biochemical variations in lens were still present, whereas aqueous humor values did not significantly differ from control values. Ultrastructural abnormalities of the lens appeared only 1 year after PRK In the animals that received only the preparation for PRK the biochemical and ultrastructural differences did not significantly vary as compared to the data obtained from control animals. These findings suggest that the biochemical and ultrastructural lens alterations induced by PRK may represent events relevant to cataractogenesis in the rabbit.
Tags: Animal; Male
Descriptors: *Cataract--Etiology--ET; *Cornea--Surgery--SU; *Keratectomy, Photorefractive, Excimer Laser--Adverse Effects--AE; *Lens, Crystalline --Radiation Effects--RE; *Radiation Injuries, Experimental--Etiology--ET; Aqueous Humor--Metabolism--ME; Aqueous Humor--Radiation Effects--RE; Ascorbic Acid--Metabolism--ME; Cataract--Metabolism--ME; Cataract --Pathology--PA; Glutathione--Metabolism--ME; Hydrogen Peroxide--Metabolism --ME; Lens, Crystalline--Metabolism--ME; Lens, Crystalline--Ultrastructure --UL; Malondialdehyde--Metabolism--ME; Microscopy, Electron, Scanning; Rabbits; Radiation Injuries, Experimental--Metabolism--ME; Radiation Injuries, Experimental--Pathology--PA
CAS Registry No.: 50-81-7 (Ascorbic Acid); 542-78-9 (Malondialdehyde) ; 70-18-8 (Glutathione); 7722-84-1 (Hydrogen Peroxide)

8/5/2 (Item 2 from file: 155)
DIALOG(R)File 155:MEDLINE(R)

08018575 95013150
Vitreoretinal ablation with the 193-nm excimer laser in fluid media.
Palanker D; Hemo I; Turovets I; Zauberman H; Fish G; Lewis A
Hadassah Hospital Laser Center, Hebrew University of Jerusalem, Israel.

Invest Ophthalmol Vis Sci (UNITED STATES) Oct 1994, 35 (11) p3835-40, ISSN 0146-0404 Journal Code: GWI
Languages: ENGLISH
Document type: JOURNAL ARTICLE
JOURNAL ANNOUNCEMENT: 9501
Subfile: INDEX MEDICUS

PURPOSE. To ablate retina and vitreous membranes using the 193-nm argon fluoride excimer laser in a fluid medium. METHODS. A special delivery system for the 193-nm excimer laser was developed that enabled the delivery of the laser into high-absorption liquid environments. The system was tested on the retina in an in vitro cup preparation of cow's eyes, and also in vivo on retina and vitreous membranes of rabbit eyes. The depth of cut as a function of laser energy was determined for an ablating needle with a 0.25-mm exit diameter. RESULTS. Gentle cutting of retinal tissue and of vitreous membranes was obtained in an energy range of 0.075 to 0.25 mJ/pulse. At the energy level of 0.075 mJ/pulse, four pulses were required for full-depth cut formation in rabbit retina, whereas at energy levels greater than 0.17 mJ/pulse, one pulse was sufficient for full-depth cut formation. The maximal rate of cutting achieved for the bovine retina was 2 mm/sec at a 20-Hz repetition rate of the laser. Ablation occurred only when the tip was held in contact with the tissue. CONCLUSIONS. The technology described herein appears to be advantageous and applicable to a variety of vitreoretinal surgical procedures.

Tags: Animal; Support, Non-U.S. Gov't; Support, U.S. Gov't, Non-P.H.S.
Descriptors: *Laser Surgery; *Retina--Surgery--SU; *Vitreous Body --Surgery--SU; Body Fluids; Cattle; Cell Membrane; Laser Surgery --Instrumentation--IS; Rabbits; Retina--Pathology--PA; Vitreous Body --Pathology--PA

8/5/3 (Item 3 from file: 155)
DIALOG(R)File 155:MEDLINE(R)

06744140 91299644
Endothelial reaction to perforating and non-perforating excimer laser excisions in rabbits.

Koch JW; Lang GK; Naumann GO
Department of Ophthalmology, University Erlangen-Nuernberg, Germany.

Refract Corneal Surg (UNITED STATES) May-Jun 1991, 7 (3) p214-22, ISSN 1042-962X Journal Code: AY0
Languages: ENGLISH
Document type: JOURNAL ARTICLE
JOURNAL ANNOUNCEMENT: 9110
Subfile: INDEX MEDICUS

With an ArF excimer laser (193 nm, 750 mJ/cm2, 20 Hz) and a special slit-mask system, perforating and non-perforating linear keratectomies were performed in 55 rabbit corneas with a follow-up from 1 hour to 6 months. Varying the pulse number according to ablation rate (0.8 micron/pulse) and corneal thickness, four linear radial excisions (3 mm length, 70 microns width) of increasing depth (70%, 80%, 90%, 100% perforation) were produced. The corneas were processed for light microscopy, scanning and transmission electron microscopy, and vital staining of the endothelium. Except for mild cell contact alterations and discrete single cell damage in the 90% deep excisions, no endothelial damage could be detected after non-perforating keratectomies. Minute (less than 20 microns) and small (20 to 100 microns maximal diameter) perforations induced cell enlargement, formation of pseudopodia, rosette-like figures, multi-nucleated giant cells, and ultimately uniform reformation of the cell pattern (1 hour to 7 days postoperatively). Larger excimer laser defects of Descemet's membrane (greater than 100 microns) were overgrown by dedifferentiated endothelial cells producing a new PAS-positive basement membrane. Vital staining revealed the complete and stable reorganization of the endothelium over these lesions within 6 months. Our observations are similar to those

reported on the endothelial repair process following other surgical manipulations (knife incisions, direct Nd:YAG-laser trauma) and support the applicability of excimer lasers for corneal trephination in patients.
Tags: Animal; Support, Non-U.S. Gov't
Descriptors: *Endothelium, Corneal--Surgery--SU; *Laser Surgery; Cell Movement; Descemet's Membrane--Pathology--PA; Endothelium, Corneal --Pathology--PA; Follow-Up Studies; Rabbits; Random Allocation; Wound Healing--Radiation Effects--RE

8/5/4 (Item 4 from file: 155)
DIALOG(R)File 155:MEDLINE(R)

06631490 90176001
[Excimer laser angioplasty. I. The tissue effects of a ring catheter system on peripheral arterial vessels]
Excimer-Laser-Angioplastie. Teil 1: Gewebeeffekte eines Ringkathetersystems an peripheren arteriellen Gefassen.
Duda SH; Wehrmann M; Haase KK; Huppert P; Karsch KR; Claussen CD
Abteilung fur Radiologische Diagnostik, Eberhard-Karls-Universitat Tubingen.
Rofo Fortschr Geb Rontgenstr Neuen Bildgeb Verfahr (GERMANY, WEST) Feb 1990, 152 (2) p163-7, ISSN 0936-6652 Journal Code: A7R
Languages: GERMAN Summary Languages: ENGLISH
Document type: JOURNAL ARTICLE English Abstract
JOURNAL ANNOUNCEMENT: 9006
Subfile: INDEX MEDICUS
We have carried out an experimental study using a new laser catheter on 28 cadaver femoral arteries in 14 subjects and on six aortas. This ring catheter system consists of 12 circular quartz fibres with a central lumen and allows the application of energies up to 20 mJ through a 7F flexible catheter in vivo. The laser emits ultraviolet light of a wave-length of 308 nm, in pulses of 60 ns and a frequency of 2-40 Hz. The energy within a single fibre is 5 J/cm2 and exceeds the intensity required to ablate calcifications. Histologically it has been shown that, depending on the type of tissue, 1 to 2.4 microns of tissue per pulse is removed. Experimentally, rate of progress in a calcified occlusive lesion in the femoral artery, using 20 Hz and energy transmission of 20 mJ, was 3 to 5 mm per minute. Perforation of vessel wall if the catheter tip was at right angles to it depended on the degree of atherosclerosis and was between nine and 116 seconds. Marginally, there was only minimal thermal damage.
Tags: Human; In Vitro
Descriptors: *Angioplasty, Balloon--Methods--MT; *Arteries--Surgery--SU; *Laser Surgery--Methods--MT; Angioplasty, Balloon--Adverse Effects--AE; Angioplasty, Balloon--Instrumentation--IS; Aorta, Abdominal--Anatomy and Histology--AH; Aorta, Abdominal--Surgery--SU; Arteries --Anatomy and Histology--AH; Cadaver; Femoral Artery--Anatomy and Histology--AH; Femoral Artery--Surgery--SU; Fiber Optics--Instrumentation--IS; Fiber Optics --Methods--MT; Laser Surgery--Adverse Effects--AE; Laser Surgery --Instrumentation--IS

8/5/5 (Item 5 from file: 155)
DIALOG(R)File 155:MEDLINE(R)

05325830 88172099
Wound healing following excimer laser radial keratotomy.
Rosa DS; Boerner CF; Gross M; Timsit JC; Delacour M; Bath PE
Rothschild Eye Institute, Paris, France.
J Cataract Refract Surg (UNITED STATES) Mar 1988, 14 (2) p173-9, ISSN 0886-3350 Journal Code: JPB
Languages: ENGLISH

Document type: JOURNAL ARTICLE
JOURNAL ANNOUNCEMENT: 8807
Subfile: INDEX MEDICUS

A pulsed excimer laser was used to produce radial keratotomy in vivo in human corneas and the wound healing process was studied. Fluences of 370 mJ/cm2 at a repetition rate of 20 Hz were effective and atraumatic. The wound healing process was remarkably uneventful without an inflammatory or immune reaction apparent at 21 days. Consistent flattening of the cornea was obtained by shallower cuts than with conventional radial keratotomy techniques.

Tags: Female; Human; Support, Non-U.S. Gov't
Descriptors: *Cornea--Physiology--PH; *Keratotomy, Radial; *Laser Surgery ; *Wound Healing; Adult; Cornea--Anatomy and Histology--AH; Cornea --Surgery--SU; Middle Age

8/5/6 (Item 6 from file: 155)
DIALOG(R)File 155:MEDLINE(R)

05316937 88133509
Excimer laser keratectomy for myopia with a rotating-slit delivery system.

Hanna KD; Chastang JC; Pouliquen Y; Renard G; Asfar L; Waring GO 3d
IBM Scientific Center, Paris, France.

Arch Ophthalmol (UNITED STATES) Feb 1988, 106 (2) p245-50, ISSN 0003-9950 Journal Code: 830

Languages: ENGLISH
Document type: JOURNAL ARTICLE
JOURNAL ANNOUNCEMENT: 8805
Subfile: AIM; INDEX MEDICUS

We performed argon fluoride excimer laser (193-nm) superficial keratectomy for myopia on human donor eyes and on a resected corneal disc. The laser beam was shaped by a rotating slit to produce a circular ablation 7.5 mm in diameter, with a mathematically defined profile to correct myopia. The fluence at the surface of the cornea was 200 mJ/cm2; the laser was fired at 20 Hz. Each 4.5-mJ laser pulse etched a 0.17-micron deep image of the slit in the cornea. Since the slit moved (0.03 Hz), each successive pulse etched an area adjacent to the previous one, reducing damage from repetitive pulses striking the same area. The slit scanned the cornea many times and the summation of these individual ablations produced the smooth myopic ablation profile, as shown by computerized keratographs and light and electron microscopy.

Tags: Human; In Vitro
Descriptors: *Cornea--Surgery--SU; *Laser Surgery--Instrumentation--IS; *Myopia--Surgery--SU; *Ophthalmology--Instrumentation--IS; Cornea--Ultrastructure--UL; Endothelium, Corneal--Ultrastructure--UL; Methods; Microscopy, Electron, Scanning

8/5/7 (Item 1 from file: 73)
DIALOG(R)File 73:EMBASE

06481045 EMBASE No: 1996147609
Arf 193nm excimer laser corneal surgery and photo-oxidative stress in aqueous humor and lens of rabbit: One-month follow-up

Costagliola C.; Balestrieri P.; Fioretti F.; Frunzio S.; Rinaldi M.; Scibelli G.
Eye Clinic, II University of Naples, Via F Petrarca 41-a,80122 Napoli Italy

Current Eye Research (CURR. EYE RES.) (United Kingdom) 1996, 15/4 (355-361)

CODEN: CEYRD ISSN: 0271-3683
DOCUMENT TYPE: Journal; Article
LANGUAGE: ENGLISH SUMMARY LANGUAGE: ENGLISH

Twenty male albino rabbits were studied. Four animals served as controls; the remaining 16 animals represented the treated group. All the treated animals were exposed to the same amount of energy delivered by the excimer laser (pulse rate: 20 Hz, fluence 250 mJ/cmsup 2; number of pulses: 6032; cumulative UV dose 1508 J/cmsup 2) and were divided into eight groups of 2 animals each (four eyes). Samples of aqueous humor and lens were obtained at the following intervals: 5, 10, 20 and 40 min and 1, 2, 3 and 4 weeks after photorefractive keratectomy (PRK). The levels of reduced and oxidized glutathione, hydrogen peroxide, ascorbic acid and malondialdehyde were determined. Aqueous humor analyses, twenty min after PRK, showed no significant differences with pre-treatment values, while the observed variations in lens were constantly present over the entire follow-up period (one month). These findings suggest that the biochemical lens alterations induced by PRK may represent the earliest events relevant to cataractogenesis in the rabbit.

DRUG DESCRIPTORS:
ascorbic acid--endogenous compound--ec; glutathione--endogenous compound --ec; glutathione disulfide--endogenous compound--ec; hydrogen peroxide --endogenous compound--ec; malonaldehyde--endogenous compound--ec

MEDICAL DESCRIPTORS:
*aqueous humor; *cornea surgery; *excimer laser; *laser surgery; *lens animal experiment; animal tissue; article; controlled study; follow up; keratectomy; male; nonhuman; oxidative stress; photooxidation; priority journal; rabbit

CAS REGISTRY NO.: 134-03-2, 15421-15-5, 50-81-7 (ascorbic acid); 70-18-8 (glutathione); 27025-41-8 (glutathione disulfide); 7722-84-1 (hydrogen peroxide); 542-78-9 (malonaldehyde)

SECTION HEADINGS:
012 Ophthalmology

8/5/8 (Item 2 from file: 73)
DIALOG(R)File 73:EMBASE

05925108 EMBASE No: 1994342940
Vitreoretinal ablation with the 193-nm excimer laser in fluid media
Palanker D.; Hemo I.; Turovets I.; Zauberman H.; Fish G.; Lewis A.
Lasers Center, Hadassah Hospital, PO Box 12000, Jerusalem 91120 Israel
Investigative Ophthalmology and Visual Science (INVEST. OPHTHALMOL. VIS. SCI.) (United States) 1994, 35/11 (3835-3840)

CODEN: IOVSD ISSN: 0146-0404
DOCUMENT TYPE: Journal; Article
LANGUAGE: ENGLISH SUMMARY LANGUAGE: ENGLISH

Purpose. To ablate retina and vitreous membranes using the 193-nm argon fluoride excimer laser in a fluid medium. Methods. A special delivery system for the 193-nm excimer laser was developed that enabled the delivery of the laser into high-absorption liquid environments. The system was tested on the retina in an in vitro cup preparation of cow's eyes, and also in vivo on retina and vitreous membranes of rabbit eyes. The depth of cut as a function of laser energy was determined for an ablating needle with a 0.25-mm exit diameter. Results. Gentle cutting of retinal tissue and of vitreous membranes was obtained in an energy range of 0.075 to 0.25 mJ/pulse. At the energy level of 0.075 mJ/pulse, four pulses were required

for full-depth cut formation in rabbit retina, whereas at energy levels greater than 0.17 mJ/pulse, one pulse was sufficient for full-depth cut formation. The maximal rate of cutting achieved for the bovine retina was 2 mm/sec at a 20-Hz repetition rate of the laser. Ablation occurred only when the tip was held in contact with the tissue. Conclusions. The technology described herein appears to be advantageous and applicable to a variety of vitreoretinal surgical procedures.

MEDICAL DESCRIPTORS:
*laser surgery; *retina detachment surgery
animal experiment; article; cattle; nonhuman; priority journal; rabbit; surgical technique; vitreous body

SECTION HEADINGS:
009 Surgery
012 Ophthalmology

8/5/9 (Item 3 from file: 73)
DIALOG(R)File 73:EMBASE

05361846 EMBASE No: 1993129931
Excimer laser sclerostomy: The in vitro development of a modified open mask delivery system
Allan B.D.S.; Van Saarloos P.P.; Russo A.V.; Cooper R.L.; Constable I.J.
The Lions Eye Institute, 2nd floor, 2 Verdun Street, Nedlands, WA 6009 Australia
Eye (EYE) (United Kingdom) 1993, 7/1 (47-52)

CODEN: EYEEE ISSN: 0950-222X
DOCUMENT TYPE: Journal; Article
LANGUAGE: ENGLISH SUMMARY LANGUAGE: ENGLISH

The argon fluoride (ArF) excimer laser at 193 nm ablates the ocular tissues with a new order of precision and virtually no adjacent damage. A glaucoma filtration operation has been designed in which small-bore sclerostomies are created using the ArF excimer laser delivered through an open mask. The mask plicates the conjunctiva at the limbus prior to ablation. Removing the mask at the end of the procedure allows the conjunctiva to relax back to its original position, separating the conjunctival and scleral wounds. Formal conjunctival dissection is thus avoided. Feasibility studies in cadaver pig eyes, using a fluence per pulse of 400 mJ/cmsup 2 and a pulse repetition rate of 20 Hz, indicate that sclerostomies of 300 mum diameter can be reliably formed if an en-face air jet is built into the mask to raise the pressure in the target area, preventing aqueous flooding.

DRUG DESCRIPTORS:
argon; fluoride

MEDICAL DESCRIPTORS:
*excimer laser; *glaucoma surgery; *laser surgery
animal tissue; article; cadaver; conjunctiva; cornea limbus; filtering operation; nonhuman; sclera; surgical technique; swine

CAS REGISTRY NO.: 7440-37-1 (argon); 16984-48-8 (fluoride)

SECTION HEADINGS:
009 Surgery
012 Ophthalmology

8/5/10 (Item 4 from file: 73)

03640591 EMBASE No: 1988090027

Wound healing following excimer laser radial keratotomy

Aron Rosa D.S.; Boerner C.F.; Gross M.; Timsit J.-C.; Delacour M.; Bath P.E.
Rothschild Eye Institute, 75019 Paris France

Journal of Cataract and Refractive Surgery (J. CATARACT REFRACTIVE SURG.) (United States) 1988, 14/2 (173-179)

CODEN: JCSUE ISSN: 0886-3350
DOCUMENT TYPE: Journal
LANGUAGE: ENGLISH SUMMARY LANGUAGE: ENGLISH

A pulsed excimer laser was used to produce radial keratotomy in vivo in human corneas and the wound healing process was studied. Fluences of 370 mJ/cmsup 2 at a repetition rate of 20 Hz were effective and atraumatic. The wound healing process was remarkably uneventful without an inflammatory or immune reaction apparent at 21 days. Consistent flattening of the cornea was obtained by shallower cuts than with conventional radial keratotomy techniques.

MEDICAL DESCRIPTORS:
*cornea surgery; *wound healing
histology; human experiment; human; normal human

MEDICAL TERMS (UNCONTROLLED): cornea incision

SECTION HEADINGS:
012 Ophthalmology
027 Biophysics, Bioengineering and Medical Instrumentation

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? show files;ds

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Set     Items   Description
S1      16479   (EYE? OR VISUAL(2N)ORGAN? OR RETINA? OR CORNEA? OR OPTICAL?
                 OR OPHTHALM?)(3N)SURGERY
S2     990770   LASER? OR LASER()(BEAM? OR ARRAY? OR SYSTEM?)
S3     658267   PULSE? OR PULSE()(MODULAT? OR REPETITION? OR TIME? OR DURA-
               TION?)
S4        113   REPETITION()RATE?(3W)20(3W)(HZ OR HERTZ)
S5        196   ENERGY(4W)10(W)(MJ OR MILLIJOULE?)
S6        506   CORNEA?()TISSUE?
S7          0   S4 AND S5
S8        194   S1 AND S2 AND S3
S9          0   S8 AND S4
S10         0   S8 AND S5
S11        14   S8 AND S6
S12        14   RD (unique items)
S13         3   S12 AND PY<1993
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? t s13/5/1-3

13/5/1 (Item 1 from file: 6)
DIALOG(R)File 6:NTIS

1615376 NTIS Accession Number: TIB/B91-01973
Photodynamische Untersuchungen der Wechselwirkung zwischen der Hornhaut und dem 2,9 mue m Laserpuls. (Photodynamic investigations of the interaction between cornea and 2.9 mue m laser pulses)
(Diss)
Hengji Yu
Heidelberg Univ. (Germany, F.R.). Naturwissenschaftliche-Mathematische Gesamtfakultaet.
Corp. Source Codes: 012073014; 9200426
1990 131p
Languages: German Document Type: Thesis
Journal Announcement: GRAI9203
In German.
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NTIS Prices: PC E14
Country of Publication: Germany, Federal Republic of
The study discusses a photodynamic analysis of the interaction between 2.9 mue m laser pulses and cornea tissues. The method is capable of assessing the major parameters of photothermal interaction and helps to describe the physical processes involved. It provides a theoretical basis for the further development of 2.9 mue m laser cornea surgery. An HF laser and an Er:YAG laser are used for mass-spectrometry, piezoelectric pressure wave and light absorption and scattering measurements in laser cornea removal processes. MSM measurements for the first time revealed the velocity distribution of removed substance vapor predicted by Anisimov. At the same time, the photothermal character of the process can be verified and vapor temperatures can be measured. A photothermal model developed on this basis contributes to the successful assessment of the removal rate, the removal threshold and the vapor expansion pressure excerted on the cornea surface. For HF lasers in the 1.52*10 (5) and 2.04*10 (1) 0 J/m (2) power range the vapor temperature is estimated at 373 - 693 K. For the short 2.94 mue m laser pulse the photothermal removal threshold is about 2.590 J/m (2) without losses if the absorption coefficient of the cornea is replaced by the value of water. The pressure amounts to about 1 atm. In addition, a model for plasma ignition using 2.9 mue m laser pulses is presented and further possible Er:YAG laser applications are suggested. (orig). (Copyright (c) 1991 by FIZ. Citation no. 91:001973.)
Descriptors: *Cornea; *Laser radiation; *Physical radiation effects; Pulses; Surgical materials
Identifiers: *Foreign technology; Theses; NTISTFFIZ
Section Headings: 57V (Medicine and Biology--Radiobiology); 57W (Medicine and Biology--Stress Physiology)

13/5/2 (Item 1 from file: 8)
DIALOG(R)File 8:Ei Compendex(R)

03336580 E.I. Monthly No: EIM9111-057744
Title: Interaction of erbium laser radiation with corneal tissue.
Author: Wannop, N. M.; Charlton, A.; Dickinson, M. R.; King, T. A.
Corporate Source: Univ of Manchester, Manchester, Engl
Conference Title: Proceedings of Ophthalmic Technologies
Conference Location: Los Angeles, CA, USA Conference Date: 19910121

E.I. Conference No.: 14984
Source: Proceedings of SPIE - The International Society for Optical Engineering v 1423. Publ by Int Soc for Optical Engineering, Bellingham, WA, USA. p 163-166
Publication Year: 1991
CODEN: PSISDG ISSN: 0277-786X
Language: English

Document Type: PA; (Conference Paper) Treatment: A; (Applications); X; (Experimental)
Journal Announcement: 9111
Abstract: The potential of an erbium-YAG laser for corneal surgery has been assessed under a range of operating parameters. The ablation threshold has been measured at approximately 0.6Jcm** minus **2 and the depth of thermal damage evaluated for different pulse durations and energy densities. The minimum damage of less than equivalent to 5 mu m was shown to occur for a pulse duration of 1 mu s or less. The implications of these results are discussed and further developments are suggested. (Author abstract) 21 Refs.
Descriptors: *BIOMEDICAL ENGINEERING--*Ophthalmology; LASERS, SOLID STATE --Medical Applications; BIOLOGICAL MATERIALS--Radiation Effects; ABLATION--Medical Applications
Identifiers: ERBIUM YAG LASER; CORNEAL SURGERY; ABLATION THRESHOLD; LASER PHOTOABLATION; RETINAL SURGERY
Classification Codes:
461 (Biotechnology); 462 (Medical Engineering & Equipment); 744 (Lasers); 641 (Heat & Thermodynamics)
46 (BIOENGINEERING); 74 (OPTICAL TECHNOLOGY); 64 (HEAT & THERMODYNAMICS)

13/5/3 (Item 1 from file: 34)
DIALOG(R)File 34:SciSearch(R) Cited Ref Sci

01263206 Genuine Article#: GJ895 Number of References: 16
Title: PLASMA-MEDIATED ABLATION OF CORNEAL TISSUE AT 1053-NM USING A ND-YLF OSCILLATOR REGENERATIVE AMPLIFIER LASER
Author(s): NIEMZ MH; KLANCNIK EG; BILLE JF
Corporate Source: UNIV HEIDELBERG,INST ANGEW PHYS/D-6900 HEIDELBERG//FED REP GER/; INTELLIGENT SURG LASERS INC/SAN DIEGO//CA/92121; UNIV CALIF SAN DIEGO,DEPT OPHTHALMOL/LA JOLLA//CA/92093
Journal: LASERS IN SURGERY AND MEDICINE, 1991, V11, N5, P426-431
Language: ENGLISH Document Type: ARTICLE
Geographic Location: FEDERAL REPUBLIC OF GERMANY; USA
Subfile: SciSearch; CC CLIN--Current Contents, Clinical Medicine
Journal Subject Category: MEDICAL LABORATORY TECHNOLOGY; SURGERY
Abstract: Plasma-mediated ablations were performed on human donor corneas with a short pulsed Nd:YLF laser system at 1053 nm. The pulses were 60 psec in duration at a repetition rate of 1.0 kHz. The laser beam was oriented perpendicular to the cornea surface. The threshold energy densities for ablation of epithelium, Bowman's membrane and stroma were measured. They were 6.1 +/- 1.8 J/cm2, 21.0 +/- 5.1 J/cm2 and 10.4 +/- 1.8 J/cm2, respectively. The mean rate of tissue removal at the stromal energy density threshold was about 1-mu-m per pulse. The walls of the laser excisions were smooth with distortions of less than 1-mu-m. A new quantitative model of plasma-mediated ablation is introduced and found to closely predict the observed results. Based on the promising nature of the experimental data further investigations are planned in the use of a mode locked Nd:YLF laser as an alternative to excimer lasers for refractive corneal surgery.
Descriptors--Author Keywords: CORNEAL SURGERY; ND-YLF LASER; PLASMA-MEDIATED ABLATION
Identifiers--KeyWords Plus: EXCIMER LASER; NM
Research Fronts: 89-0980 002 (EXCIMER LASER ABLATION; CORNEAL WOUND

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      REPAIR INVITRO; SURFACE-STRUCTURE OF POLYMERS)
    89-2169 001   (AM HERCULIS SYSTEMS; CYCLOTRON EMISSION; ECLIPSING
      LOW-MASS X-RAY BINARY; MAGNETIC CATACLYSMIC VARIABLES; ORBITAL PERIOD)
  Cited References:
      BADO P, 1987, V12, P319, OPT LETT
      BEKEFI G, 1966, RAD PROCESSES PLASMA
      BORES LD, 1983, V23, P93, INT OPHTHALMOL CLIN
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      MARSHALL J, 1985, V92, P749, OPHTHALMOLOGY
      MURRAY JE, 1983, V4, P488, IEEE J QUANTUM ELECT
      NIEMZ MH, 1990, P LASERS 90 SAN DIEG
      POLLAK TM, 1982, V2, P159, IEEE J QUANTUM ELECT
      PULIAFITO CA, 1985, V92, P741, OPHTHALMOLOGY
      SRINIVASAN R, 1987, V103, P470, AM J OPHTHALMOL
      STERN D, 1989, V107, P587, ARCH OPHTHALMOL-CHIC
  ?
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? show files;ds

File 155:MEDLINE(R) 1966-1999/Nov W4
         (c) format only 1999 Dialog Corporation
File  73:EMBASE 1974-1999/Sep W2
         (c) 1999 Elsevier Science B.V.
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File 162:CAB HEALTH 1983-1999/Aug
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Set     Items   Description
S1      57193   (EYE? OR VISUAL(2N)ORGAN? OR RETINA? OR CORNEA? OR OPTICAL?
                OR OPHTHALM?)(3N)SURGERY
S2     157639   LASER? OR LASER()(BEAM? OR ARRAY? OR SYSTEM?)
S3     244702   PULSE? OR PULSE()(MODULAT? OR REPETITION? OR TIME? OR DURA-
               TION?)
S4         40   REPETITION()RATE?(3W)20(3W)(HZ OR HERTZ)
S5         48   ENERGY(4W)10(W)(MJ OR MILLIJOULE?)
S6       1544   CORNEA?()TISSUE?
S7          0   S4 AND S5
S8        456   S1 AND S2 AND S3
S9          3   S8 AND S4
S10         6   S8 AND S5
S11         6   S10 NOT S9
S12         3   RD (unique items)
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? t s9/5/all

9/5/1 (Item 1 from file: 155)
DIALOG(R)File 155:MEDLINE(R)

05325830 88172099
Wound healing following excimer laser radial keratotomy.
Rosa DS; Boerner CF; Gross M; Timsit JC; Delacour M; Bath PE
Rothschild Eye Institute, Paris, France.
J Cataract Refract Surg (UNITED STATES) Mar 1988, 14 (2) p173-9, ISSN 0886-3350 Journal Code: JPB
Languages: ENGLISH
Document type: JOURNAL ARTICLE
JOURNAL ANNOUNCEMENT: 8807
Subfile: INDEX MEDICUS
A pulsed excimer laser was used to produce radial keratotomy in vivo in human corneas and the wound healing process was studied. Fluences of 370 mJ/cm2 at a repetition rate of 20 Hz were effective and atraumatic. The wound healing process was remarkably uneventful without an inflammatory or immune reaction apparent at 21 days. Consistent flattening of the cornea was obtained by shallower cuts than with conventional radial keratotomy techniques.
Tags: Female; Human; Support, Non-U.S. Gov't
Descriptors: *Cornea--Physiology--PH; *Keratotomy, Radial; *Laser Surgery *Wound Healing; Adult; Cornea--Anatomy and Histology--AH; Cornea --Surgery--SU; Middle Age

9/5/2 (Item 1 from file: 73)
DIALOG(R)File 73:EMBASE

05361846 EMBASE No: 1993129931
Excimer laser sclerostomy: The in vitro development of a modified open mask delivery system
Allan B.D.S.; Van Saarloos P.P.; Russo A.V.; Cooper R.L.; Constable I.J.
The Lions Eye Institute, 2nd floor, 2 Verdun Street,Nedlands, WA 6009 Australia
Eye (EYE) (United Kingdom) 1993, 7/1 (47-52)

CODEN: EYEEE ISSN: 0950-222X
DOCUMENT TYPE: Journal; Article
LANGUAGE: ENGLISH SUMMARY LANGUAGE: ENGLISH

The argon fluoride (ArF) excimer laser at 193 nm ablates the ocular tissues with a new order of precision and virtually no adjacent damage. A glaucoma filtration operation has been designed in which small-bore sclerostomies are created using the ArF excimer laser delivered through an open mask. The mask plicates the conjunctiva at the limbus prior to ablation. Removing the mask at the end of the procedure allows the conjunctiva to relax back to its original position, separating the conjunctival and scleral wounds. Formal conjunctival dissection is thus avoided. Feasibility studies in cadaver pig eyes, using a fluence per pulse of 400 mJ/cmsup 2 and a pulse repetition rate of 20 Hz, indicate that sclerostomies of 300 mum diameter can be reliably formed if an en-face air jet is built into the mask to raise the pressure in the target area, preventing aqueous flooding.

DRUG DESCRIPTORS:
argon; fluoride

MEDICAL DESCRIPTORS:

*excimer laser; *glaucoma surgery; *laser surgery
animal tissue; article; cadaver; conjunctiva; cornea limbus; filtering operation; nonhuman; sclera; surgical technique; swine

CAS REGISTRY NO.: 7440-37-1 (argon); 16984-48-8 (fluoride)

SECTION HEADINGS:
009 Surgery
012 Ophthalmology

9/5/3 (Item 2 from file: 73)
DIALOG(R)File 73:EMBASE

03640591 EMBASE No: 1988090027
Wound healing following excimer laser radial keratotomy
Aron Rosa D.S.; Boerner C.F.; Gross M.; Timsit J.-C.; Delacour M.; Bath P.E.
Rothschild Eye Institute, 75019 Paris France
Journal of Cataract and Refractive Surgery (J. CATARACT REFRACTIVE SURG.) (United States) 1988, 14/2 (173-179)

CODEN: JCSUE ISSN: 0886-3350
DOCUMENT TYPE: Journal
LANGUAGE: ENGLISH SUMMARY LANGUAGE: ENGLISH

A pulsed excimer laser was used to produce radial keratotomy in vivo in human corneas and the wound healing process was studied. Fluences of 370 mJ/cmsup 2 at a repetition rate of 20 Hz were effective and atraumatic. The wound healing process was remarkably uneventful without an inflammatory or immune reaction apparent at 21 days. Consistent flattening of the cornea was obtained by shallower cuts than with conventional radial keratotomy techniques.

MEDICAL DESCRIPTORS:
*cornea surgery; *wound healing
histology; human experiment; human; normal human

MEDICAL TERMS (UNCONTROLLED): cornea incision

SECTION HEADINGS:
012 Ophthalmology
027 Biophysics, Bioengineering and Medical Instrumentation

? t s12/5/all

12/5/1 (Item 1 from file: 155)
DIALOG(R)File 155:MEDLINE(R)

09999310 99302390
Dodick laser phacolysis: thermal effects.
Alzner E; Grabner G
Eye Department, County Hospital Salzburg, Austria.
J Cataract Refract Surg (UNITED STATES) Jun 1999, 25 (6) p800-3, ISSN 0886-3350 Journal Code: JPB
Languages: ENGLISH
Document type: JOURNAL ARTICLE
JOURNAL ANNOUNCEMENT: 9909
Subfile: INDEX MEDICUS
PURPOSE: To gather experimental data on whether Dodick laser phacolysis leads to corneal or scleral burns. SETTING: The Eye Department, County Hospital Salzburg, Salzburg, Austria. METHODS: The study was done using a pulsed neodymium:YAG (Nd:YAG) laser with a wavelength of 1064 nm; energy, 10 mJ; and duration of pulses, 14 ns. The light pulse is carried by a 400 microns quartz fiber to the laser phacolysis probe. The laser light hits a titanium target inside the tip, causing an optical breakdown and thus a shock wave. The generation of both plasma and the shock disrupt the nuclear material. The temperature at the ultrasonic phaco and laser phacolysis tip was measured under air and balanced salt solution (BSS) in a test chamber and in the anterior chambers of eye-bank eyes. RESULTS: Ultrasonic phacoemulsification led to a difference in temperature up to 55.3 degrees C under air, 12 degrees C in BSS, and 10.9 degrees C in the anterior chamber. There was no clinical significant heat generated by the laser phacolysis tip. CONCLUSION: This initial in vitro study demonstrates that the well-known risk of the tissue heating (i.e., phaco burn) does not occur with Dodick laser phacolysis, even when the irrigation flow is slow or discontinued.
Tags: Human
Descriptors: *Body Temperature; *Cornea--Injuries--IN; *Eye Burns --Etiology--ET; *Laser Surgery--Adverse Effects--AE; *Phacoemulsification --Adverse Effects--AE; *Sclera--Injuries--IN; Anterior Chamber--Surgery--SU ; Eye Burns--Prevention and Control--PC; Intraoperative Complications --Prevention and Control--PC; Laser Surgery--Instrumentation--IS; Phacoemulsification--Instrumentation--IS

12/5/2 (Item 2 from file: 155)
DIALOG(R)File 155:MEDLINE(R)

09024343 97255151
Neodymium:YLF picosecond laser segmentation for retinal traction associated with proliferative diabetic retinopathy.
Cohen BZ; Wald KJ; Toyama K
Retina Associates of New York, NY 10021, USA. raony@interport.net
Am J Ophthalmol (UNITED STATES) Apr 1997, 123 (4) p515-23, ISSN 0002-9394 Journal Code: 3OQ
Languages: ENGLISH
Document type: CLINICAL TRIAL; CLINICAL TRIAL, PHASE I; JOURNAL ARTICLE
JOURNAL ANNOUNCEMENT: 9706
Subfile: AIM; INDEX MEDICUS
PURPOSE: To determine the applicability of laser segmentation for severing fibrovascular tissue and hyaloid interfaces in the treatment of tractional complications of proliferative diabetic retinopathy. METHODS: A prototype neodymium:yttrium-lithium-fluoride (Nd:YLF) picosecond pulse photodisruptive laser was used in eight eyes (seven patients) with

proliferative diabetic retinopathy as part of a Food and Drug Administration-approved phase 1 protocol. There were three indications for treatment: type I: distortion and shallow elevation of the macular caused by taut, adherent, posterior hyaloid interface (two eyes); type II: traction retinal detachment involving the fovea (two eyes); and type III: fovea-threatened, traction retinal detachment (four eyes). Traction release was accomplished by laser segmentation of the detached hyaloid interfaces and fibrotic, contracted proliferative tissue. The Nd:YLF uses low pulse energy (0.10 mJ, 1,000 pulses per second for 10 consecutive seconds) that allows tissue cutting near the retinal surface. RESULTS: Both type I eyes had relief of traction forces; visual acuity improved from 20/400 to 20/50 in one eye; the other remained stable. Of the two type II eyes, one had anatomic reattachment of the fovea with improvement in visual acuity (hand movements to 20/50); the second required vitrectomy. Of the four type III eyes, all had anatomic improvement; three maintained pretreatment acuity; the fourth eye developed vitreous hemorrhage at 6 months and underwent vitrectomy. Three treatments (two eyes) caused vitreous hemorrhage that resulted in a transient drop in acuity (1 to 2 lines). No patient developed a retinal break or choroidal hemorrhage. CONCLUSION: In a small pilot study, the Nd:YLF laser segmented proliferative tissue near the retinal surface and elevated hyaloid interfaces. In selected cases, this may enable flattening of traction retinal detachment or release of retinal distortion.

Tags: Case Report; Female; Human; Male; Support, Non-U.S. Gov't

Descriptors: *Diabetic Retinopathy--Complications--CO; *Laser Surgery; *Retinal Detachment--Surgery--SU; Adult; Aged; Diabetic Retinopathy --Physiopathology--PP; Fibrosis--Etiology--ET; Fibrosis--Surgery--SU; Fluorescein Angiography; Fundus Oculi; Middle Age; Pilot Projects; Postoperative Complications; Retina--Pathology--PA; Retina--Surgery--SU; Retinal Detachment--Etiology--ET; Retinal Detachment--Physiopathology--PP; Retinal Neovascularization--Etiology--ET; Retinal Neovascularization --Surgery--SU; Visual Acuity

12/5/3 (Item 3 from file: 155)

DIALOG(R)File 155:MEDLINE(R)

04701113 85225020

Q-switched neodymium-YAG laser angle surgery in open-angle glaucoma.

Robin AL; Pollack IP

Arch Ophthalmol (UNITED STATES) Jun 1985, 103 (6) p793-5, ISSN 0003-9950 Journal Code: 830

Languages: ENGLISH

Document type: JOURNAL ARTICLE

JOURNAL ANNOUNCEMENT: 8509

Subfile: AIM; INDEX MEDICUS

In a short-term pilot study, we evaluated Q-switched neodymium-YAG laser angle surgery in 25 eyes from 22 patients with medically uncontrolled open-angle glaucoma. All eyes had unacceptable intraocular pressures (IOPs), despite maximum tolerated medical therapy, argon laser trabeculoplasty, and prior intraocular filtration surgery (eight eyes). Using a pulse energy of 10 millijoules, ten spots were placed approximately 4 degrees apart in the mid-trabecular meshwork using an Nd-YAG laser (Coherent 9900). The mean preoperative and final postoperative IOPs were 30 +/- 6 mm Hg and 21 +/- 8 mm Hg, respectively. The mean follow-up time was five (+/- 3) months (range, two to 14 months). The final postoperative IOP was less than 22 mm Hg in 17 eyes (68%). Holes within the trabecular meshwork were visible in 14 eyes, and laser therapy was associated with the liberation of debris into the anterior chamber in all eyes. Complications included transient postoperative IOP elevation (eight eyes), angle bleeding (six eyes), and posterior displacement of the iris root (four eyes).

Tags: Female; Human; Male

Descriptors: *Glaucoma, Open-Angle--Surgery--SU; *Lasers--Therapeutic Use --TU; Adolescence; Adult; Aged; Intraocular Pressure; Middle Age; Neodymium ; Trabecular Meshwork--Surgery--SU

CAS Registry No.: 7440-00-8 (Neodymium)

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